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# VETERINARY MEDICINE

AUGUST CONTENTS 1947

**Veterinary Progress, Policies and Comments**

Arkansas Uses Spray Trucks, 277; First Federal Meat Inspection Law, 277; Extent of Malaria, 277; The Stethoscope, 277; Rabies in Michigan, 278; Dairy Goats in New York State, 278; Pullorum Disease in a Coot, 278; Efficacious Screwworm Smear, 278; Enteritis from Duck Eggs, 278; A New Reason for Eradicating Rabies, 279; New Antihistamines, 279; Mules Dropped from Aircraft by Parachute, 279; Vibrionic Abortion in Cattle, 280; AVMA Exhibit at the AMA Centennial Celebration, 281; Packer-Pay Meat Inspection, 281; Disease Threats from South of the Border, 282; New Brucellosis Vaccine, 282; Tail Chewers in Mink, 283; Occurrence of Trichinosis in Mink, 283; Foot-and-Mouth Disease, 296; High Cost of Swine Parasites, 298; Recent Research in Britain, 298; Greyhound Racing, 301; Vitamin $B_1$ and Social Dominance, 305.

**An Improved Chemical Dehorning Agent for Young Calves** ..... 284

**Toxicological Observations on Goats Fed Large Doses of DDT** ..... 289

**Swine Brucellosis** ..... 294

**Gastroenteritis in Young Pigs** ..... 297

**Infectious Venereal Granuloma in Greyhounds** ..... 299

**Phenothiazine Poisoning in a Farm Dog** ..... 302

**A Symptomatic Treatment for Canine Hysteria** ..... 304

**Use of Quaternary Ammonium Compounds in Protozoan Diseases of Poultry** ..... 306

**Clinical Reports** ..... 311-315

Lymphatic Leucemia in a Dog, 311; Dyspnea of Unknown Origin in a Collie, 312; Pulpy Kidney Disease in Lambs, 313; Mandibular Paralysis in a Dog, 313; Diaphragmatic Hernia in a Boston, 314; Radiotherapy in Adenocarcinoma of the Anus, 314; The Intravenous Use of Formalin as a Hemostatic, 315.

**Abstracts** ..... 316-317

Unsuspected Prevalence of Rabies, 316; Hereditary Lameness in Red Danish Cattle, 316; Chlorophyll in Wound Healing, 316; Rayon as a Surgical Dressing for Surface Wounds, 316; Treatment of Mange in Horses, 317; Technic of Sero-Anatoxitherapy of Tetanus, 317.

**Book Reviews** ..... 318

Blood Hounds and How to Train Them, 318; Diseases of the Pig and Its Husbandry, 318; Laws About Dogs, 318; The Practice of Veterinary Medicine, 318.

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# VETERINARY MEDICINE

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The American College of Surgeons contributed $40,000 to the restoration fund of the Royal College of Surgeons of England.

From a test by the Bureau of Dairy Industry, USDA, it was concluded that penicillin has no practical application in the preservation of milk or other foods.

Biologists state that nomenclature is but a mechanism for handling the data appertaining to biology and as such taxonomy should be well ordered and comprehensible. Wonder what pathologists would say of disease nomenclature? Should it be "well ordered and comprehensible" or picked out of a hat by a blindfolded person?

The State Veterinarian of Arkansas, Dr. Joe S. Campbell, has 27 spray trucks in operation for the application of DDT. A charge of 10 cents per animal, which covers the cost of operation, is made. An average of one gallon of 2.5% DDT suspension is required per animal and 6,000 animals are sprayed per month by each truck. There is a keen demand for the spraying on the part of Arkansas cattlemen.

In a survey of more than 3000 cows at Washington State College, E. C. McCullough found 34% having one or more quarters showing some degree of abnormality. Of the quarter samples of milk examined 64% contained staphylococci; 28% streptococci. Penicillin infusions stopped the shedding of staphylococci temporarily but in most instances the organisms reappeared after seven to fourteen days.

The Leighton poultry farm at Warsaw, Indiana, has 80,000 Leghorn layers.

Laveran discovered the malaria protozoon in 1880 (Nov. 6). After 68 years the disease is world-wide in distribution and endemic in many countries. In India alone it causes more than a million deaths annually. Yet it is the first disease for which a specific treatment was discovered.

The first federal meat inspection law enacted by the Congress, Aug. 30, 1890, provided for inspection of salted pork and bacon intended for exportation, when the laws, regulations or orders of any foreign government required inspection, or when any buyer, seller or exporter of such meats requested such inspection. Foreign governments refused to recognize such inadequate inspection.

The stethoscope, in popular writing a symbol of the medical profession, is only 128 years old. The first description of it was published by René Läennec in 1819. Prior to that time physicians attached slight importance to heart and respiratory sounds. Although the greater part of a century elapsed before the use of the stethoscope became general, in the meantime Läennec's discovery had stimulated greatly the interest in thoracic sounds and auscultation by direct application of the ear to the chest. Läennec, a French physician, is credited with being one of the three who have contributed most to our knowledge of tuberculosis; the other two being Robert Koch, a German research scientist and Wilhelm Roentgen, a German physicist. Läennec became a victim of the disease and died at the age of 45.

In handling mastitis, some clinicians find monthly collection of specimens of milk for microscopic examination from each cow in the herd to be an advantageous routine.

In a study recently completed at the George Williams Hooper Foundation, University of California, Dr. Karl F. Meyer found psittacosis virus in three of 11 ducks, from Petaluma County, the center of the poultry industry in California.

In an experiment at the Arkansas station pigs made a satisfactory growth on a ration containing only 0.5 part per million of manganese, but reproduction failed on this ration. When sufficient manganese was added to bring it to 6ppm reproduction was satisfactory.

## Rabies in Michigan

Eighty-four cases of rabies were diagnosed during March and April in the laboratories of the Michigan department of health. Surprisingly, 12 cases (14.28%) in which no Negri bodies could be found were discovered by animal inoculation.

## Dairy Goats in New York State

Popularity of dairy goats in New York State is steadily increasing among farm families. Increased use of goats' milk would improve the nutrition of such families, according to Cornell University's animal-nutrition laboratory.

A good goat will produce enough milk for a family of three or four for seven to nine months of the year. Two goats that freshen several months apart should meet the need fully. Six to eight goats can be kept on the feed required to maintain a family cow.

The nutritional requirements are similar to other farm animals.—*J. K. Loosli.*

## Pullorum Disease in a Coot

A coot *(Fulica americana)* collected at Buckeye Lake, Ohio, by Dr. Robert Rausch, East Lansing, Michigan, was found on examination to have a diseased ovary. A pure culture of *Salmonella pullorum* was obtained from the ovary. The coot is supposed to have acquired the infection from barnyard fowls, since coots are often closely associated with them around farm ponds. It is apparent the infection might easily go the other way and result in the introduction of the disease on a farm previously free from it. Pullorum disease has been reported frequently from a number of wild birds, but this is the first on record from the Rallidae family.—*J. Wildlife Management,* 2:2 (April), 1947.

According to Gorman, hydrocephalus in mink kits is increasing in prevalence. This is a recessive lethal and responsible for considerable loss. Apparently mink breeders are making no effort to eliminate, from their breeding stock, animals carrying the gene for hydrocephalus.

## Efficacious Screwworm Smear

The best treatment for wounds infested with screwworm larvae, according to Ext. Serv. Bul. 123, Florida Agr. Exp. Sta., is swabbing the wounds with a smear containing:

| | |
|---|---|
| Diphenylamine | 7 parts |
| Benzol | 7 parts |
| Turkey red oil | 2 parts |
| Lamp black | 4 parts |

Myelitis in dogs commonly is manifested by paralysis of one or more limbs. If the lumbar portion of the spinal cord is affected, urinary and fecal incontinence may be noted. Myelitis usually causes flaccid paralysis. Peripheral anesthesia and trophic disturbances are frequently observed in myelitis. Disturbances of consciousness, epileptiform seizures and vomiting are absent.

## Fatal Enteritis from Duck Eggs

*Salmonella typhimurium* VI-phage was isolated from the blood and feces of patients dying from enteritis according to the Montana health bulletin. There was a history of the consumption of duck eggs immediately before the onset of the illness. The same organism was isolated from eggs from the same flock and from ovaries and intestinal tract of some of the ducks composing the flock.

## Placenta and Fetal Envelopes in Cats

The placenta of the cat presents the aspect of a thick belt circling the middle part of the chorion (simple circular placenta); this chorion forms an elongated sac of which the two extremities join with the envelopes of adjacent fetuses. The allantois shows an internal or amniotic layer, and an external or chorionic layer, closely united to the chorion. The umbilical vesicle constitutes a transversely elongated sac, contained between the amnion and the internal allantoid layer, provided, in its middle section, with a narrow pedicle which is prolonged into the umbilical cord; its walls are extremely vascular. The allantoid portion of the umbilical cord is very short, and enveloped in a large fold of the allantois.—*From Le Chat by Larieux and Jumaud, Vigot frères, Paris.*

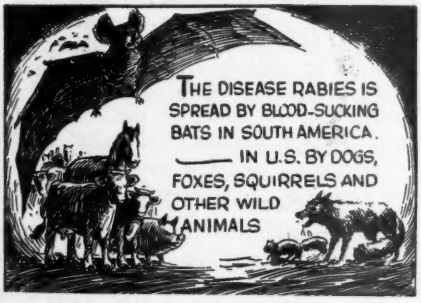
The principle should be laid down that in any organized society someone must have the last word and, if society is to function, people must abide by final decisions, submerge their differences and cooperate in *trying* to make the decisions work.

In 1901, 107 of every 10,000 children under five years of age in New York City died of infant diarrhea during the three summer months. By 1927 the deaths for this disease per 10,000, for the corresponding three summer months, had been reduced to four. Certainly the infant diarrhea deathrate was very directly associated with the sanitary quality of the milk supply.—PAUL CORASH in *Cor. Vet* 38:1. 1947.

## A New Reason for Eradicating Rabies

With the campaign against foot-and-mouth disease in Mexico well launched, Texas cattlemen may turn their attention to another possible menace to their industry from south of the Border—vampire bats.

Most of Central and South America is included in the range of the vampire bat. In some districts it is a common carrier of rabies virus and frequently inoculates cattle, less often the equidae and occasionally man with




*American Foundation for Animal Health*

the disease. Cattle cannot be raised on some ranges without having been vaccinated against rabies.

Recently two colonies of vampire bats *(Desmodus rufus)* were discovered by an American speleologist in caves only 300 miles south of the Rio Grande. Previously these bats which are migratory were not known to exist so far north.

Although most bats are beneficial insectivores, vampire bats, in addition to being the most important South American vector of rabies, are also vectors of murrina (trypanosomiasis) among horses and mules and are suspected as carriers of yellow fever and scrub typhus of man.

According to the U. S. Public Health Service, the five organisms most frequently incriminated in food poisoning during the past year were: Staphylococcus, Streptococcus, Salmonella, Shigella, and *Eberthella typhosa*. This arrangement is in order of decreasing importance.

## New Antihistamines

French savants, Halpern and DeBray, have developed a new series of synthetic antihistamines which they claim to be far more potent than those formerly available, antergan and neoantergan.[1] Tolerance of the new products is excellent and the effect prompt.

## Plague Treated with Sulfadiazine

Deaths from bubonic plague in Fukien, China, for six weeks in the summer of 1944 were 56, or 51.4% of those infected. Huang and Chu* tried the efficacy of sulfadiazine on 25 victims of the infection. Sulfadiazine alone was given to 16, sulfadiazine and antiplague serum to three and sulfathiazole and serum to four. Five fatalities occurred, three of patients treated with sulfadiazine and two of those treated with sulfadiazine and serum.

## Mules Dropped from Aircraft by Parachute

During the late war, an experiment was conducted by the veterinary service of the British Army in India to ascertain whether it is feasible, in emergencies, to drop mules from aircraft by parachute to provide animal reinforcement for small detachments in situations where no landing strips can be improvised. The problem of ejecting the mules from the plane was solved by narcotizing them with chloral hydrate and securing them to a padded wooden platform, to which U. S. Army river crossing equipment had been lashed (six collapsible casualty carrying pontons each with two air bladders over which further cushioning was provided by a partially inflated Ranger boat). The platform was mounted on a truck in the body of the plane, so balanced that two men could push it to the door and tip it sufficiently to slide it out. Mule loads were ejected successfully at an altitude of 600 feet. It required 55 minutes for packing and loading the mule and seven minutes on the landing site for releasing and saddling. The mules were capable of carrying a load within 15 to 20 minutes after being dropped.

---

[1] Chavance, Jean. Histamine theory and treatment of laminitis. *Vet. Med.*, 41:6, pp. 199-201. 1946.

*Treatment of bubonic plague with sulfadiazine, Huang, C. H., and Chu, L. W. *Am. J. Trop. Med.*, 2 E, pp 749-870. 1946.

## Vibrionic Abortion in Cattle

Although the majority of abortions in cattle are apparently caused by *Brucella abortus*, infection with *Vibrio fetus* has become increasingly important as an explanation of abortion in herds free of brucellosis and trichomoniasis. The low incidence of vibrionic abortion so far reported in cattle in the United States may be due to the fact that a search is seldom made for the causative organism. The disease has been observed in cattle in New Jersey, Connecticut, California, and Illinois, and has been found in sheep in New York, Montana, Michigan, and Illinois. During the past year the disease has been encountered in two dairy herds in Illinois, and further study may reveal that it is more common than was heretofore believed.

Evidence of the infectious nature of *Vibrio fetus* was first obtained in England in 1913 by M'Fadyean and Stockman, who isolated the Vibrio from the uterine discharge of aborting sheep. The organism was described, named, and established as the cause of bovine abortion by Theobald Smith during the period 1918-1923. *Vibrio fetus* appears as a motile, comma-shaped or S-shaped organism in fetal tissues.

Vibrionic abortion may occur between the second and seventh months of pregnancy, but nearly always occurs late in pregnancy. Infection in a herd apparently starts rather suddenly and then tends to die out. Losses may or may not occur the year following an outbreak. Whether or not this is a result of immunization or of the fact that the organism itself has very low powers of survival is not known.

The pathological changes in vibrionic abortion are much the same as those observed in brucellosis. The seat of the disease is the fetal membranes. From here the Vibrio makes its way into the fluid surrounding the fetus, then, because it is the habit of the fetus to swallow this fluid, the Vibrio invades the digestive and respiratory tracts of the fetus. Compared with the colorless, translucent fluid of the normal fetus, the fluid in the stomach of the diseased fetus is turbid, yellowish, and thick. The body fluids are more or less tinged with blood.

The presence of *Vibrio fetus* may be detected by examining the stomach fluid or the fluid surrounding aborted fetuses for motile, spiral-shaped organisms. The organism is isolated by culturing the amniotic fluid, fetal tissues, and stomach contents of the aborted fetus by the same methods as are used to isolate *Brucella abortus*. A practical agglutination test which can be used in diagnosing the disease has not yet been developed.

The source of the infection in cattle is not known. It is possible that sheep are a reservoir of infection, since the disease is seen most often in these animals. The Vibrio may possibly be spread from one animal to another grazing on pastures contaminated with the discharges of infected animals. Prompt removal of infected animals from a herd is recommended as a means of controlling the disease. Although the water supply is frequently blamed as the infective agent, *Vibrio fetus* is probably too delicate an organism to exist long in water.

The possibility of *Vibrio fetus* infection should be investigated in those herds in which abortions are occurring, and especially in herds which are known to be free of *Brucella abortus* and *Trichomonas foetus*. Because of the delicate nature of the organism, the aborted fetus and its membranes should be collected and packed as free from contamination as possible, and should be shipped or taken as quickly as possible to a diagnostic laboratory for examination.—*Animal Pathology Exchange*, Department of Animal Pathology and Hygiene, University of Illinois.

* * * *

Cystic ovaries usually occur in cows that produce a large amount of rich milk. When the cysts are ruptured the milk flow decreases.

* * * *

Four cows known to be infected with *Br. abortus*, and shedding the organisms in the milk, were treated with a total of three million units of penicillin each, over a six-day period. Under the conditions of this trial, penicillin had no effect on the course of the infection.—D. T. BERMAN *et al* in *Cor. Vet.* 36:4.

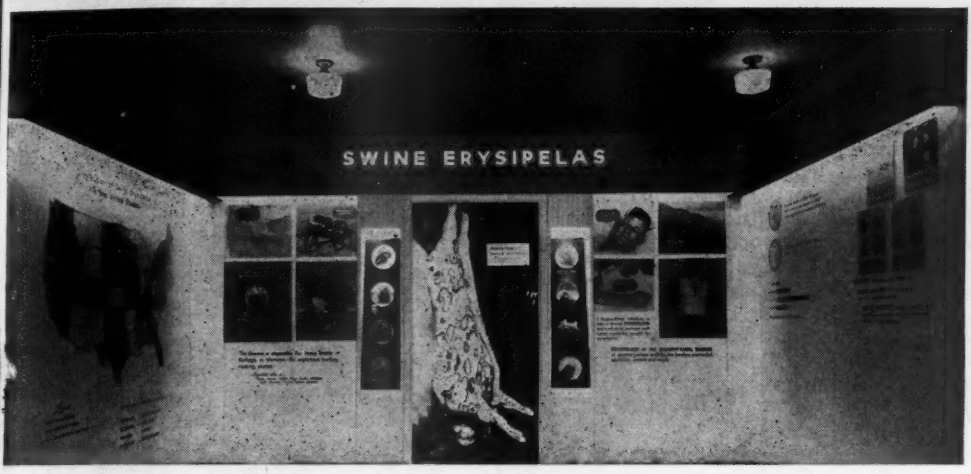
* * * *

## Semen Dilution

In an investigation involving 5765 inseminations no difference in fertility was found between dilution rates of 1:40, 1:60, 1:80, or one part of bull semen in 100 parts of egg yolk-citrate diluent. At the highest rate of dilution an average of 12,836,000 spermatozoa were introduced in each 1cc of diluted semen used for insemination.

* * * *

The milk industry is a complex and interesting one. It is estimated that there are 50,000 fluid milk distributors in the United States and 40,000 plants processing milk, butter, cheese, ice cream and other dairy products employing approximately 250,000 persons. Milk has also invaded the industrial field and is used in plastics, textiles, paper coating, paint, glue, films, pharmaceuticals, insulation, fertilizer, insecticides, penicillin, plaster, dyes, animal feed, preservatives, explosives and electroplates.—*Hygeia.*




## A. V. M. A. Exhibit at A. M. A. Centennial Celebration

The American Veterinary Medical Association had a booth in the hall of scientific exhibits at the centennial meeting of the American Medical Association at Atlantic City, N. J., June 9-13, 1947.

After consideration of many suggestions for the central theme of the exhibit, swine erysipelas was decided upon for the main subject of the exhibit with collateral showing of the *Erysipelothrix rhusiopathiae* and lesions of the disease in man. The selection proved to have been a fortunate one as the doctors attending the meeting showed great interest in this disease and its transmission from swine and fish to man.

The material used in the exhibit was assembled from the Bureau of Animal Industry, USDA, Drs. L. Van Es, J. D. Ray and Frank Breed and from several publications.

Drs. J. D. Ray, R. C. Klussendorf and George W. Stiles had charge of the exhibit. During the four days of the meeting of the A.M.A. 800 persons stopped at the exhibit to ask questions about it of those in charge. Among this number were many dermatologists including such notable figures as J. V. Klauder, M.D., Philadelphia, Chas Armstrong, M.D., U. S. Public Health Service, Bernard Appel, M.D., Tufts Medical College, R. M. Atwater, M.D., executive secretary, American Public Health Association, E. J. Hoxie, M.D., Loma Linda, Calif., R. P. Kaudle, M.D., State Board of Health, Trenton, N. J., W. E. Herrell, M.D., Mayo Foundation and T. C. Hull, M.D., who had charge of all scientific exhibits for the convention.

A large number in passing stopped to view the exhibit and read inscriptions on the illustrations but asked no questions and were not counted among the 800 mentioned in the foregoing paragraph. Those who asked questions and gave their names were from all parts of the United States and from Argentine, Austria, Brazil, Canada, China, Cuba, Holland, Iran, Mexico, the Philippine Republic, Puerto Rico, Sweden, Switzerland, Turkey and Venezuela.

* * * *

## Packer-Pay Meat Inspection

As most readers know the Agriculture appropriations bill, as passed by the lower House of the Congress, contained a provision for the payment of the cost of federal meat inspection by the meat packers having such inspection. This would follow the plan obtaining in federal poultry meat inspection, which has experienced a great growth in recent years. The inspectors would be paid by the government, as at present, but the government in turn would collect fees from the packers to reimburse the U. S. Treasury for its outlay for the inspection service.

The Senate committee, to which this proposed legislation was referred, held public hearings. Not a great deal of interest was shown in the proposed change. The meat packing industry has offered some understandable objection to bearing the cost of meat inspection and B.A.I. officials in Washington are said not to favor passage of the bill. Secretary Anderson is definitely opposed to the change. Veterinarians employed in the meat inspection service at the packing houses are said to be enthusiastically in favor of the change. Dr. A. R. Miller, Chief of the Meat Inspection Service testified before the Senate committee that the change would not affect the quality of the inspection service or the morale of the inspectors.

Without attempting an evaluation of the merits or demerits of the proposed change,

upon which experts disagree, there is one probable effect of the change that would be highly desirable—the probability that the proportion of inspected to uninspected meat, consumed by the public, will be materially increased within a few years, thus reversing a trend of the war and post-war years. Of no public concern but not without interest to veterinarians is the probable increase in the number of inspectors required, many of whom would likely be part time inspectors, recruited from among local practitioners.

With the cost of the inspection borne by the plant receiving it, there will be little valid excuse for not supplying inspection to all that apply for it and meet requirements, irrespective of whether or not the applicant ships his products interstate, and it is reasonable to expect such a plan to be followed in the near future. Thus we may see inspection extended rapidly among plants doing mainly an intrastate business.

The frozen food locker industry has increased materially the consumption of uninspected meat during its astonishingly rapid growth. The proposed change in operation of federal meat inspection and its extension to a large number of the small abattoirs might very well lead to an insistent demand, from both plants and patrons for locker plant inspection. Efforts to obtain the "little purple stamp" as an aid to selling is not to be lightly relinquished by those who can qualify for it. In California the state legislature is, even now, considering placing frozen food locker plants under the provisions of the state meat inspection law.

## Disease Threats from South of the Border

Concern that the present outbreak of foot-and-mouth disease in Mexico may bring disaster to our cattle industry is not the first that livestock sanitary officials have felt over the prospects of importation of animal disease from that country.

The report of the Chief of the Bureau of Animal Industry, USDA, for 1894 states:

> Renewed importations of Mexican cattle make it imperative that the regulations concerning the importation of cattle should be so modified as to bring them into harmony with the act of August 30, 1890.
>
> Imported Mexican cattle are required to be held for inspection as provided by law, but inspection of large herds of these wild cattle cannot be thorough and should not be relied upon to prevent the introduction of disease. It is my opinion that, until the authorities define the Texas-fever district, and provide competent inspectors to certify that cattle coming from that country are free from infection, all Mexican cattle should be treated as infected.

Sharp and Dohme, Inc., have made a grant to the College of Veterinary Medicine, University of Illinois, for research on the value of various sulfonamides in the treatment of diseases of livestock including poultry.

In herds going through an "abortion storm" the test and slaughter method for the control of bovine brucellosis is economically and scientifically unsound. Such herds are benefited by adult vaccination. It takes the edge off the attack.—HERBERT LOTHE.

★ ★ BUY U. S. SAVINGS BONDS ★ ★

Effective June 16, 1947, requirements for discharge of all non-volunteer officers of the Medical Department of the Army were reduced to a service of two years, except for certain specialists for whose service there is critical need. Veterinary officers of the categories mentioned are not subject to exceptions, but will be discharged upon completion of two years of service.

## New Brucellosis Vaccine

After years of experimentation and field trials, it is announced that commercial preparation of the Huddleson brucellosis vaccine will begin in September.

This vaccine is made from the mucoid phase of *Brucella suis*. It can also be produced from *Br. mellitensis*. It is said to produce a high degree of immunity against all three types of Brucella—mellitensis, abortus and suis. In extensive experimental and field trials on animals of all ages, it has proved incapable of causing disease in laboratory or farm animals. It has been used during all stages of pregnancy and is reported not to have caused abortion in or to have been isolated from the udder of any animal.

The Huddleson brucellosis vaccine causes animals to react positively to the agglutination test, but the agglutination titer disappears in less than 90 days even in adult animals.

It has been studied on nearly 30,000 animals in 48 herds. The outbreaks had just occurred in the herds at the time of treatment, yet the spread of the disease was checked immediately in all but one herd, even though in many instances infected animals were retained in the herd.

As a therapeutic agent this new vaccine is said to have considerable value; about 25% of reacting animals having ceased to react within six months, following vaccination.

For the present, sales of the new vaccine will be limited to Michigan veterinarians.

# Veterinary Problems of the Fur Ranch

By T. T. CHADDOCK, M.S., D.V.M.

## Tail Chewers in Mink

*Definition.*—Tail chewing is a common condition, in mink of all ages and sexes, in which the animal, of its own will, performs numerous tail amputations. These cases should not be confused with tail sucking or fur chewing as these are due to different causes.

*Etiology.*—The causative factor of this condition is the occluding or blocking of the small papillae at the end of the ducts leading from the musk glands to the walls of the vent or anus.

*Pathology.*—In the wild, mink during its daily hunt for food for survival, encounters numerous enemies, and has occasion to leave its card of identification on numerous rocks along the creek it explores. In the course of the day, the animal has occasion to express some of the musk that accumulates in two small glands lying subcutaneously one on each side of the anus. I have never found engorged musk glands present in wild caught mink, probably because of this daily ejection of a small amount of the secretion. The trapper who has been caught without a gun and has tried to club a mink to death in a trap, can attest to the fact that there is certainly nothing wrong with the functioning of the musk glands.

However, ranch raised mink oftentimes become so lazy and listless, due to the good care, that they have little occasion to become of bad disposition. As a result, through non-use, the openings of the small ducts known as the papillae become constricted, thus causing considerable irritation. This condition is comparable to the plugged anal glands of the dog, however, I have never observed fistula formation. This is probably due to the fact that if the irritation is not relieved, the mink finally destroys itself.

If the condition is untreated, the irritation causes the animal to perform numerous tail amputations. This is quite mystifying to the owner, as the animal does a lot of squealing and bleeds profusely. The tail is never allowed to heal and as the rancher describes the animal: "it goes berserk." The end comes when the mink amputates the base of the tail and finally removes the entire anus.

*Treatment.*—Expression of the musk from the musk glands gives prompt relief and then the animal will leave the tail alone. By inserting the little finger into the anus and exerting pressure on the outside of the musk gland with the thumb, the musk can be expressed.

The animal should be restrained by two catchers in an inverted position in order to facilitate treatment. The contents of both glands located on each side of the vent should be expressed. One treatment is sufficient in most cases. The end of the tail should be cleaned and treated as any other open wound.

Liquid or oil base materials should not be used, externally, on mink during the winter months, as this could easily cause the death of the animal due to freezing. Powdered iodoform has proved to be a satisfactory wound treatment, but due to its offensive odor, is not too desirable as the owner will acquire a professional odor. A wound healing powder that is satisfactory and easily applied by the use of a powder blower, consists of the following ingredients:

| | |
|---|---|
| Powdered urea | 60% |
| Sulfathiazole | 20% |
| Sulfanilamide | 20% |

Clean fresh marsh hay or clean rags should be placed in the nest box, so that the chances of tail infection is reduced.

*Prognosis.*—The outcome of these cases is very good if the owner realizes early that there is something in the way of treatment that can be given the affected mink.

★ ★ ★ ★

## Occurrence of Trichinosis in Mink

It has been learned recently that *Trichinella spiralis* is of quite common occurrence in foxes of some of the Scandinavian countries. This parasitism has been observed also in mink. This condition was produced in ranch raised fur bearers, as a result of war conditions.

When the Nazis occupied Norway; the livestock was commandeered for food for the army of occupation. The sources of meat for fur farmers were practically exhausted and the offal of the slaughtered animals and what fish could be obtained were substituted for the former rations. Later the fur farmers began feeding fox carcasses to both fox and mink. This practice has come to be a common procedure in the Scandinavian countries. Of course, the feeding of parasitized carcasses is conducive to the completion of the life cycle of *Trichinella spiralis.*

As far as is known, this parasite is not at present of importance in ranch-raised fur animals of the United States and Canada. However, it is well to be aware of this condition in instances of future importations of fur animals, from the Scandinavian countries, into the United States.

# An Improved Chemical Dehorning Agent for Young Calves

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WITH the domestication of animals, horns have ceased to be a necessary or useful part of the integument. In fact horns on cattle are not only useless but actually costly to the livestock man, since at every market, horned cattle regardless of condition bring at least 25 cents a hundred weight less than polled, for the packers know that horns or tipped horns are probably the greatest single cause of bruising of slaughter cattle. Horned cattle do more fighting and consequently need twice as much bunkroom in the feed lot. Horns on dairy cattle are often responsible for udder injuries and sometimes make such animals unsafe to the owner. It has become a common practice to remove the horns from mature animals by surgical methods or to destroy the developing horn in the young calf by the application of caustic substances.

Dehorning of older animals is attended by considerable shock and it may take two or three weeks for them to recover completely. Such an operation exposes the frontal sinus to bacterial infections, blow flies and screw worms which, if not fatal, results in loss of condition or diminished gains. Unless proper precautions are taken, dehorning instruments can be the means of spreading disease.

Obviously the most opportune time for dehorning is when the animal is young, as the economic value is less and in addition the developing horn can be destroyed with little or no shock to the animal. Dehorning of these young animals may be accomplished by means of a hot, bell shaped iron, a tubular gouge or spoon or by the application of caustic chemicals. Caustic pastes composed of alkalies, such as potassium and/or sodium and calcium hydroxides, are commonly used as dehorning agents. These pastes are quite irritating and cause considerable pain when applied, consequently the animal frequently dislodges the medicament before sufficient time has elapsed for the destruction of the horn. Nursing calves may rub the paste on the dam's udder and flank and cause severe burning of these tissues. These caustics extract water from the tissues and the alkalies are often carried down the lateral aspect of the head and sometimes into the eyes of the animal, causing excessive destruction of tissue and considerable pain.

The studies herein reported were undertaken for the purpose of exploring the possibilities for developing a safe effective chemical dehorner without the inherent disadvantages possessed by the commonly used caustic pastes.

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## Materials and Methods

Most of the calves used for these studies were purchased from the Farmers Livestock Sales Barn in Ashland, Ohio. A few were obtained from a neighboring dairyman. The ages of the calves from the sales barn could not be definitely ascertained, but it is estimated that they were from five days to two weeks of age when treated.

The hair was clipped from the skin over and around the developing horn and all loose hair and dandruff brushed away. The liquid medicament was then applied to the area with a small wood handle brush covering a spot about the size of a 25 cent piece over the horn bud and contiguous skin. All animals were observed at frequent intervals for symptoms of irritation after application of the escharotic substance to the horn button. In the case of one calf used for toxicity studies, the temperature was recorded daily for 14 days and blood counts and weights were taken each week for 10 weeks.

All of the chemicals used for preparation of the escharotic formulations were of chemically pure or U. S. P. grade. The quantities of ingredients in each formulation are expressed on a percentage weight basis.

## Data

Preliminary tests were made with the following known escharotic substances: Chromic acid, trichlor-acetic acid, arsenous acid, arsenic trioxide, antimony pentachloride, phenol, and antimony trichloride. These substances were applied as solutions, in an ointment base or alone. With the exception of a flexible collodion solution of antimony trichloride all of the above caustic agents proved either ineffective, for destroying the horns or too irritating for use on young calves.

Further work showed that a solution composed of antimony trichloride, salicylic acid and flexible collodion was an effective dehorning agent possessing several advantages over the commonly used caustics. Preparation of this solution was accomplished by adding finely ground antimony trichloride and salicylic acid to flexible collodion in a tightly closed container. Shaking the mixture resulted in the formation of a coagulated mass,

which gradually went into solution. It is important that the antimony trichloride be anhydrous, otherwise an insoluble precipitate of antimony oxychloride is formed.

The efficacy of various formulas containing antimony trichloride for destroying the horns on 32 young calves is shown in Table I. In this series, five horns on four calves were effectively destroyed with formula 1, which consisted of 17% antimony trichloride and 83% flexible collodion. Formula 2 consisted of 30% antimony trichloride and 70% flexible collodion. It was applied to 20 horns on 12 calves with the result that 18 horns were satisfactorily destroyed. In the case of calf 572 the horn areas had been previously treated with antimony trichloride incorporated in a base of pine tar. This formulation proved unsatisfactory as the calf was in considerable pain after treatment and rubbed its head against the pen dislodging the medicament. At the time that formula 2 was applied the horn areas were raw and quite sensitive and the animal quickly displaced the solution.

Formula 3 consisting of 15% antimony trichloride, 15% salicylic acid and 70% flexible

TABLE I.—EFFICACY OF VARIOUS FORMULAS CONTAINING ANTIMONY TRICHLORIDE FOR DESTROYING THE DEVELOPING HORNS ON YOUNG CALVES

| Calf No. | Breed[1] | Horns treated | Treatment | Date of application | Date of last observation | Visible horn growth |
|---|---|---|---|---|---|---|
| | | | Formula Number[2] | 1946 | 1946 | |
| 564 | J | Both | 1 | 3/21 | 4/15 | None |
| 433 | H | Right | 1 | 5/8 | 6/25 | None |
| | | Left | 4 | 5/10 | 6/25 | None |
| 562 | G | Both | 2 | 3/21 | 4/15 | None |
| 561 | G | Both | 3 | 3/21 | 4/15 | None |
| 563 | J | Left | 1 | 3/21 | 4/20 | None |
| | | Right | None | | 4/20 | Normal growth |
| 565 | G | Right | Alkali paste[3] | 3/21 | 4/15 | None |
| | | Left | 1 | 3/21 | 4/15 | None |
| 560 | J | Both | 2 | 4/18 | 11/10 | None |
| 571 | He | Both | 2 | 4/18 | 5/15 | None |
| 572 | G | Both | 2 | 4/18 | 5/9 | Slight |
| 573 | J | Both | 2 | 4/18 | 6/25 | None |
| 574 | G | Both | 2 | 4/18 | 6/25 | None |
| 567 | J | Both | 2 | 4/18 | 5/10 | None |
| 466 | SH | Both | 2 | 4/24 | 6/26 | None |
| 467 | G | Left | 2 | 4/24 | 5/18 | None |
| | | Right | 5 | 4/24 | 5/18 | None |
| 469 | G | Right | 2 | 4/24 | 5/18 | None |
| | | Left | 4 | 4/24 | 5/18 | None |
| 438 | SH | Right | 2 | 5/8 | 10/10 | None |
| | | Left | 4 | 5/10 | 10/10 | None |
| 431 | H | Right | 2 | 5/8 | 6/2 | None |
| | | Left | 4 | 5/11 | 6/2 | None |
| 434 | A | Both | 4 | 5/8 | 10/10 | None |
| 525 | H | Both | 4 | 5/29 | 10/10 | None |
| 526 | G | Both | 4 | 5/29 | 10/10 | None |
| 527 | G | Both | 4 | 5/29 | 10/10 | None |
| 528 | G | Both | 4 | 5/29 | 10/10 | None |
| 529 | H | Both | 4 | 5/29 | 10/10 | None |
| 530 | G | Both | 4 | 5/29 | 10/10 | None |
| 531 | J | Both | 4 | 5/29 | 10/10 | None |
| 533 | H | Right | 4 | 6/26 | 10/10 | None |
| | | Left | None- | | 10/10 | Normal growth |
| 536 | G | Right | 4 | 6/25 | 10/10 | None |
| | | Left | None- | | 10/10 | Normal growth |
| 534 | SH | Right | 4 | 6/28 | 10/10 | None |
| | | Left | Alkali paste[3] | 6/26 | 10/10 | Some growth |
| 568 | G | Both | 4 | 7/19 | 10/10 | None |
| 465 | SH | Both | 4 | 7/19 | 10/10 | None |
| 569 | G | Both | 4 | 7/18 | 10/10 | None |
| 468 | G | Both | 5 | 4/24 | 6/25 | None |
| 56 | J | Both | 6 | 4/30 | 5/20 | None |

[1] Breeds are designated according to the following key—Animals of mixed breeding were classified according to the predominant breed characteristic exhibited: A—Aryshire. G—Guernsey. H—Holstein. He—Hereford. J—Jersey. SH—Shorthorn.

[2] Composition of formulas: No. 1—Antimony trichloride 17%; flexible collodin 83%. No. 2—Antimony trichloride 30%; flexible collodion 70%. No. 3—Antimony trichloride 15%; salicylic acid 15%; flexible collodion 70%. No. 4—Antimony trichloride 28%; salicylic acid 7%; flexible collodion 65%. No. 5—Antimony trichloride 28%; phenol 8%; Flexible collodion 64%. No. 6—Antimony trichloride 26%; phenol 13%; flexible collodion 61%.

[3] Composition: Sodium hydroxide 42%; calcum hydroxide 14%; water 44%.

collodion was used on both horns of one calf. This formula effectively destroyed the horn tissue and seemed to be considerably less irritating than previous formulations containing only antimony trichloride and flexible collodion.

In view of the above experience, formula 4 was prepared to contain 28% antimony trichloride, 7% salicylic acid and 65% flexible collodion. This formula was applied to 29

Fig. 1.—Appearance of Calf 534, seven months following treatment of its left horn with an alkali paste and the right horn with flexible collodion solution of antimony trichloride and salicylic acid

horn areas on 18 calves. These animals exhibited little or no signs of irritation after the product was applied. About 45 minutes after the medicament was applied to calves 465, 568 and 569 their heads were sprayed with water for 10 minutes. The film was unaffected by this treatment and there was no evidence that the escharotic chemicals were displaced from the treated areas. Observations on six of these animals (525, 526, 527, 528 and 529) extended over a period of four months and at this time there was no evidence of horn growth. One Jersey calf, (531) the age of which was definitely known, was treated with this formula at three weeks of age. No horn growth could be detected on this animal four months later. To compare the irritating properties of formula four with a commonly used alkali paste, the left horn of a calf (534) was treated with a commercial product composed of 42% sodium hydroxide, 14% calcium hydroxide and 44% water. The animal immediately showed signs of considerable pain and ran about the pen rubbing the treated area against the pen and other calves with the result that the medicament was smeared over a considerable area of the head. Two days later the right horn was treated with formula 4 and the calf showed little or no signs of annoyance. Sufficient alkali paste was dislodged so that the left horn was incompletely destroyed as may be seen from Fig. 1. The right horn was completely destroyed as can be seen from the same photograph.

Formula 5 contained 28% antimony trichloride, 8% phenol and 64% flexible collodion. Three horns on two calves were treated with this product and although the horns were destroyed, this formula proved unsatisfactory as the phenol seemed to enhance tissue destruction without reducing the irritation.

Likewise formula 6 containing 26% antimony trichloride, 13% phenol and 61% flexible collodion satisfactorily destroyed the developing horns on one calf, but was unsatisfactory because of the increased tissue destruction and irritating properties.

From the standpoint of effectiveness and irritating properties formula 4 (28% antimony trichloride, 7% salicylic acid, 65% flexible collodion) possessed several advantages over the old type alkali preparations. A quantity of this formula was furnished to the Division of Animal Industry at the Ohio Experiment Station, Wooster, for use on calves in their beef cattle herd. Table II shows the results of applying this formula to the horn buds on 14 of their purebred Hereford calves. These calves were all treated in the pasture shortly after birth. After clipping the hair closely over the horn the fluid was brushed on and the calf released immediately, no precautions being taken to prevent it from nursing or to protect it from the rain. At no time was there any evidence of burning of the udder or flank tissues of any of the cows. The herdsman noted no evidence of excessive pain such as is often seen after application of alkalis. The calves showed some discomfort about an

TABLE II.—EFFECT OF APPLYING FORMULA 4 TO THE DEVELOPING HORNS OF PUREBRED HEREFORD CALVES

| Calf No. | Date of birth | Date of treatment | Date of last observation | Visible horn growth |
|---|---|---|---|---|
| 51 | 8/3 | 8/7 | 4/4 | None |
| 52 | 8/5 | 8/7 | 4/4 | None |
| 54 | 8/12 | 8/12 | 4/4 | None |
| 55 | 8/13 | 8/14 | 4/4 | None |
| 57 | 8/18 | 8/19 | 4/4 | None |
| 61 | 8/22 | 8/22 | 4/4 | None |
| 63 | 8/27 | 8/27 | 4/4 | None |
| 64 | 9/3 | 9/4 | 4/4 | None |
| 68 | 9/29 | 9/29 | 4/4 | None |
| 69 | 10/11 | 10/12 | 4/4 | None |
| 70 | 10/19 | 10/20 | 4/4 | None |
| 71 | 10/23 | 10/23 | 4/4 | None |
| 72 | 11/1 | 11/1 | 4/4 | None |
| 73 | 12/9 | 12/9 | 4/4 | None |

hour after treatment which was manifested by shaking the head occasionally. None of the calves were in any way adversely affected by the treatment. Shortly after the application of the solution to calf 57, the dam proceeded to lick it off. The following day the calf was treated again with no further interference from the dam. At the time of the last observation of these calves careful examination revealed no horn growth.

A study of the toxicity of formula 4 was made on one Hereford calf. A total of 17.3 grams of this formula was applied with a small brush to an area over the poll and frontal area approximately 10 by 14 centimeters. The animal was restrained a short time until the medicament had dried into a firmly adhering film. Drying was hastened by directing a current of air from an electric fan over the area. At no time did this calf appear to be in excessive discomfort. The appetite was not impaired and the animal gained steadily over a period of seven weeks, increasing in weight from 86 pounds at the time of treatment to 161 pounds nine weeks later when the experiment was terminated. Daily temperature records for two weeks showed no significant deviation from the normal. Weekly blood studies indicated no significant alteration in the numbers of the cellular elements.

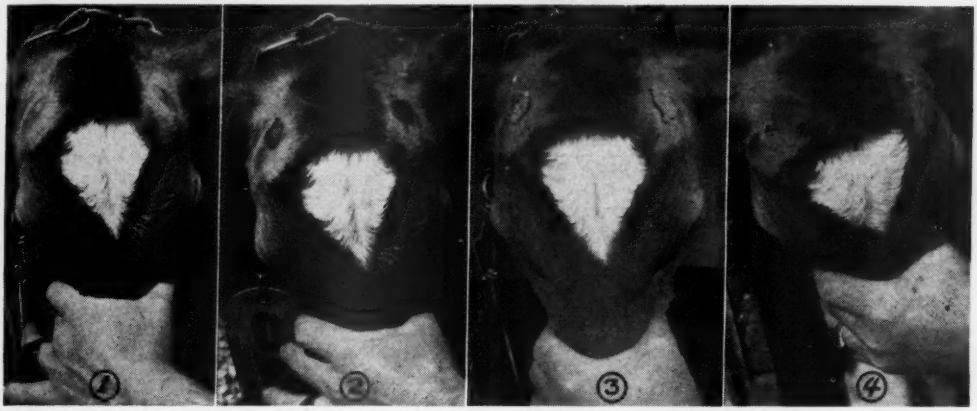


**Fig. 2.—Calf 530. (1) after clipping the hair from over the horn buttons, (2) a few minutes after applying flexible collodion solution of antimony trichloride and salicylic acid, (3) as it appeared 14 days after treatment and (4) 30 days following treatment**

**Fig. 3.—Calf 530—showing complete absence of horn growth three months after treatment**

The average quantity of solution necessary to treat one calf was found to be approximately 1.6 grams. Since the above calf received slightly over 10 times this amount at a single application and showed no symptoms of intoxication, the margin of safety appears to be satisfactory.

## Discussion

From the foregoing data it appears that an escharotic solution composed of 28% antimony trichloride, 7% salicylic acid and 65% flexible collodion will effectively destroy the developing horn tissue on young calves. The solution may be applied easily, by means of a small brush. In contrast to the commonly used alkali pastes or sticks such a solution dries quickly into a firmly adhering flexible film which is much less irritating and also possesses the added advantage that the escharotic substances will not run down from the treated area should the calf be exposed to the rain. Destruction of the underlying tissues takes place gradually and there is no weeping or oozing of fluid to carry the caustic substances

down the side of the head such as often happens after application of alkalis.

After the application of the solution there is an edema of the surrounding tissues which makes the treated area appear as a circular sunken area. Later this treated area appears as a hard dry eschar which gradually loosens and falls away leaving in most cases a surface almost completely healed. Nursing calves may be dehorned with this solution and safely turned back with the dam in a short time for, after the evaporation of the volatile constituents of the collodion, a water insoluble film is formed, which adheres to the surface of the skin and effectively confines the escharotic chemicals, so that there is no danger of burning the udder and flank of the dam.

**Fig. 4.—Calf 536—Its left horn was untreated. Right horn was treated two months previously with flexible collodion solution of antimony trichloride and salicylic acid**

For consistent results the solution must be applied when the horn is in the early developmental stages. Calves should be treated when they are from one to 14 days of age. Possibly some may be successfully treated at a later age as the horns were effectively destroyed on one Jersey calf at three weeks of age.

That there is a reasonably wide margin of safety for this escharotic solution is indicated from a toxicity test in which approximately 10 times the quantity necessary to destroy both horns of the average calf was applied to the head of one calf which exhibited no symptoms of intoxication over a period of seven weeks. The entire area of treated skin underwent a dry necrosis with the formation of a hard dry scab which dropped away in about five weeks. The area gradually healed and became covered with hair.


## Summary

Data are presented on six escharotic formulas which were prepared and tested as chemical dehorning agents on 47 young calves. A solution composed of 28% antimony trichloride, 7% salicylic acid and 65% U. S. P. flexible collodion proved effective for destroying the horn in its early stages. Such a solution is superior to the commonly used alkalis, in that the escharotic chemicals are confined in a water resistant flexible film which adheres closely to the horn area and destroys the underlying tissue with much less pain to the animal than the alkaline escharotics cause. There is also less danger of burning the udder and flank area of the dam when nursing calves are treated.

Toxicity studies on one calf revealed no evidence of any ill effects following the application of quantities greatly in excess of the amount necessary for the prevention of horn growth.


* * * *

Removal of the corpus luteum in pyometra will usually evacuate the uterus in about 48 hours. A mummified fetus will usually be delivered in about the same period following removal of the corpus luteum.

* * * *

## Duties of Veterinary Livestock Inspector

In a state civil service examination in California this month to create a list of eligibles for the position of livestock inspector in that state the duties that will devolve upon those appointed are listed as:

Under direction doing veterinary work involved in the control of diseases of livestock including examining and testing livestock in the field and in abattoirs; conducting tuberculin tests; inspecting livestock for external parasites; assisting livestock owners in dipping animals in connection with the control and eradication of scabies and ticks; making mallein tests for the detection of glanders in horses; investigating and instituting control procedure in connection with outbreaks of diseases; making sanitary inspections of premises where livestock are kept; inspecting poultry for diseases; inspecting livestock at stockyards for evidence of disease; inspecting foreign shipments of animal products at ports of entry; making ante and post-mortem examinations of animals to be used for human consumption; maintaining cooperative relations with health, dairy, and livestock inspectors relative to animal disease control; keeping field records and submitting reports of work done; and doing other work as required.

# Toxicological Observations on Goats Fed Large Doses of DDT*

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THE report of Telford and Guthrie (1945) indicates that goats are quite resistant to DDT. They showed that after oral administration to goats DDT was evidently excreted with the milk in sufficient amounts to be definitely toxic to rats fed such milk. Woodard, Ofner and Montgomery (1945) determined appreciable quantities (0.04 to 0.06mg per gram) of the drug in the milk of dogs after DDT was given orally. These very interesting observations were confirmed in five experiments with goats, which were at our disposal.

A young nanny goat with a nursing kid was fed DDT dissolved in vegetable oil by stomach tube in doses of 50 and 100mg per kilogram, body weight, on five days per week. Milk was collected daily with few exceptions and samples were analyzed for DDT at intervals as indicated in Figure 1, using the method described by Ofner and Calvery (1945) which is based on the color reaction of Schechter and Haller (1944).

Because this goat was still nursing her kid, the total milk production could not be measured and, therefore, only the concentration, not the total excretion of DDT in milk could be determined.

After the second dose the animal showed some nervous tension. It became excitable and frightened, showed shivering of the ears, tail, back and legs, and at times appeared to have difficulty in remaining on its feet. This condition persisted in varying intensity throughout the 55 days of the experiments, but it never passed into severe tremors or convulsions. Since the milk secretion gradually decreased and finally stopped entirely, the experiment was discontinued. As illustrated in Figure 1, after an initial drop this goat maintained her weight throughout the experiment. The kid, which fed mostly on hay, gained gradually in weight and at no time showed indications of DDT poisoning. As indicated in the uppermost section of Figure 1, the excretion of DDT with the milk was rather irregular, but at times fairly high concentrations of about 0.5mg/gm and on two occasions even as much as about 1mg/gm were determined. The reason for these fluctuations was not established, but it was found that the DDT accumulated in the milk fat. Amounts of 2.688 and 3.959mg/gm were found in the cream and only 0.018 and 0.015mg/gm in the skim milk of the same sample, the latter values being within the limit of the blank determined in the milk. It is therefore apparent that after large oral doses of DDT in vegetable oil the compound appears in the milk fat and is excreted with the milk in fairly high concentrations. Skim milk at best contains only traces.

In order to determine the *single fatal dose of DDT* for goats, 500mg of DDT per kilogram of body weight was dissolved in vegetable oil and given *via* the stomach tube to a male goat weighing 35.44kg. The animal showed no immediate toxic effects; on the second day it became frightened and nervous and developed moderate tremors which on the third and fourth days were somewhat more marked, but three days later had fully recovered from all toxic manifestations. Similarly, a dose of 1000mg/kg given to another male goat caused, on the second day, tenseness, excitability and a certain stiffness of the legs; all these symptoms disappearing after three days. Because of the limited solubility of DDT in vegetable oil the dose could not be further increased without the use of such large amounts of oil that this, of itself, would cause disturbances of the gastrointestinal tract. It can, therefore, be stated only that the single fatal dose of DDT for goats is probably greater than 1000mg per kilogram of body weight.

A young nanny goat with a nursing kid was fed DDT

For the appraisal of the fatal dose of DDT

*From the Industrial Hygiene Research Laboratory, National Institute of Health, U. S. Public Health Service.

for goats it was therefore necessary to resort to repeated oral administration of doses of 1000mg/kg and to determine how many such doses could be tolerated. Four goats of different weight and including both sexes were given such doses with the following results:

Goat No. 81 (female, 20.9kg) was fed 1000mg/kg of DDT in vegetable oil by stomach tube two days apart. Following the first dose it was very nervous and excitable and suffered from severe tremors. After the second dose it developed, in addition, tonic-clonic convulsions and ceased to drink or to take food. During the subsequent six days it recovered from these effects, but after the third, fourth, fifth and six doses, given on the 9th, 13th, 14th and 15th days of the experiment, the same toxicological picture developed; the animal was lying constantly on the floor in uninterrupted clonic-tonic convulsions. It was finally sacrificed after the sixth dose because its death was expected during the night, after having ingested a total of 121gm (5.8gm/kg) of DDT. At autopsy a turbidity was noted in the exterior half of the anterior chamber of one eye and several small ulcerlike turbidities were seen in the cornea of both eyes. The right eye also showed a small hemorrhage between the sclera and the iris. There were no signs of muscular atrophy nor of icterus. The abdominal cavity showed nothing abnormal except that the omentum was practically free of fat tissue and that it contained a few discrete white areas of non-inflammatory nature adjacent to the veins. The liver, kidney, adrenals and urinary bladder were grossly normal; the spleen was contracted and the walls of the gastrointestinal tract showed no signs of irritation. Lungs and heart were also normal.

The brain presented the same slight and rather indefinite cellular changes as have been reported in other species (Lillie and Smith, 1944; Lillie, Smith and Stohlman, 1946). Tigroid was quite well preserved in many brain stem nuclei and the spinal cord. Some pericellular vacuolation was noted about anterior horn cells of the cord and in central cerebellar nuclei.

Goat No. 968 (female, 23.6kg) showed severe excitement, nervousness and tremors the day following the first dose of DDT of 1000mg/kg. There was improvement during the next day. After the second dose it developed, in addition, clonic-tonic convulsions and was unable to stand. After the four subsequent doses it developed violent spasms and was unable to stand or to take water or food. After the last dose it was in such poor condition that it was not expected to live over night, and therefore was sacrificed after having ingested a total of 141.6gm of DDT (6.0gm per kilogram of body weight). Like the first animal it showed an opacity in the outer half of the cornea. There were no signs of icterus. The omentum contained small amounts of fat, and small conglomerations of unknown composition were seen in the omentum and also in the perirenal fat and other parts of the abdominal cavity. Liver, kidneys and adrenals were grossly normal, the spleen was contracted and the gastric

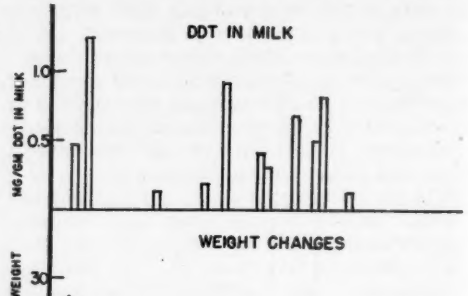



**Figure 1 illustrates the excretion of DDT in milk and the weight changes of a goat receiving daily doses of DDT as indicated in the lowest section**

walls showed no signs of irritation. The lungs were normal, but the heart showed fatty changes with small, cheesy deposits along some of the smaller veins.

Again tigroid was quite well preserved in most brain stem nuclei and the spinal cord. Pericellular vacuolation was noted in cerebral cortex, thalamus, ventral and dorsal cochlear, tectile, dentate and accessorial nuclei and spinal cord.

Goat No. 967 (male, 25kg) had been given a single dose of 1000mg/kg prior to the continued administration of the same dose. After the first dose he developed moderate tremors and tenseness which became slightly more marked after the second dose and increased after subsequent doses. After the eighth dose the animal was unable to stand and died dur-

ing the night after the ninth dose, having received a total of 276gm (11.0gm/kg) of DDT. The autopsy of this animal gave no evidence of icterus or gross pathological changes but because it had been dead over night the organs were not sufficiently fresh to justify a histopathological examination.

Goat No. 966 (male, 36.7kg) had received one single dose of 1000mg/kg four weeks prior to the beginning of the continued feeding experiment. The first dose produced some tremors, chattering of the teeth and moderate clonic-tonic convulsions; subsequent doses gave essentially the same picture and the animal died during the night following the eleventh dose, after having received a total of 424.6gm (11.7gm/kg) of DDT. As with the preceding animal the autopsy gave no evidence of icterus or any gross injury of the vital organs and for the reasons given before, no histopathological examination was made.

The toxicological manifestations observed in these animals may be summarized as follows: In contrast to smaller animals in which toxic doses of DDT cause toxic manifestations after two to five hours, with goats these were delayed for 12 to 24 hours probably because, the goat being a ruminant, the material stayed for a longer period in the gastric system and absorption was delayed. The first symptoms were apprehensiveness and excitability, but the most striking feature of early and late poisoning was the tremor. This tremor was coarse and rapid and involved the trunk, extremities, neck, ears, tongue and tail. It varied in amplitude and rate, the latter averaging approximately two to four oscillations per second. The tremor persisted unaltered in muscle groups when the animal was supported in such a way that these muscle groups were not under tension, and it could not be stilled by forcibly holding a part of the body immobilized. Excitement and apprehension increased the amplitude of the tremor although this was difficult to evaluate quantitatively. Finally the animal was unable to stand; and when placed on its feet it immediately fell sideways, or the legs flexed without making any attempt at support. The reason for this inability to remain upright cannot be stated but it does not appear to be due to either a spastic or flaccid paralysis. Goats lying on the floor frequently showed pawing movements of the forelegs and stepping movements of the hind legs. These appeared to be of voluntary character and increased markedly, becoming rather violent, when the animal was disturbed or frightened, and increased in intensity with the severity of the poisoning. The muscles themselves were judged to be neither completely spastic nor flaccid, although there was possibly a moderate hypotonia. Passive movements of the extremities or neck often met with resistance, but it was decided that this was voluntary and not due to a spasticity because occasionally passive movement was carried out freely and because of the rapidity and freedom with which the extremities, head, and neck were moved voluntarily. That the animals could see and hear in advanced stages of poisoning was concluded from their alarm type of reaction when approached. Severely affected animals were able to drink a small amount of water from a shallow vessel and take a few fresh greens by mouth. There was no evidence of muscular atrophy. In the animals with advanced stages of poisoning, hypersensitivity was noted. When pressed lightly with the point of a safety pin the goat responded with violent movements of the extremities and a quite distinct and abortive attempt to bite the examiner. It appeared that this hyperesthesia existed over the entire body and that it became more severe as the poisoning progressed. Defecation and micturition appeared to function normally. Because of the tremors and excitability of the animals the tendon reflexes could not be studied satisfactorily. It is not possible at this time to offer more than a conjecture as to the site or nature of the neurological lesion responsible for these symptoms. In our opinion, the latter can best be explained on the basis of an irritative process, and one readily reversible in several areas of the brain, possibly including areas of the cerebral cortex, cerebellum, thalamus, and midbrain.

It should be pointed out that there seems to be a definite relationship between the amount of fat tissue and the resistance of the animal to DDT, inasmuch as the animals in good nutritional state with large amounts of fat in the abdominal cavity tolerated a much larger dose of DDT per kilogram of body weight than those in a poor nutritional state. That large quantities of DDT may be stored in the fat tissue is illustrated by the fact that the abdominal fat of goat No. 966 was found to contain 5.6mg of DDT per gram of fat tissue.

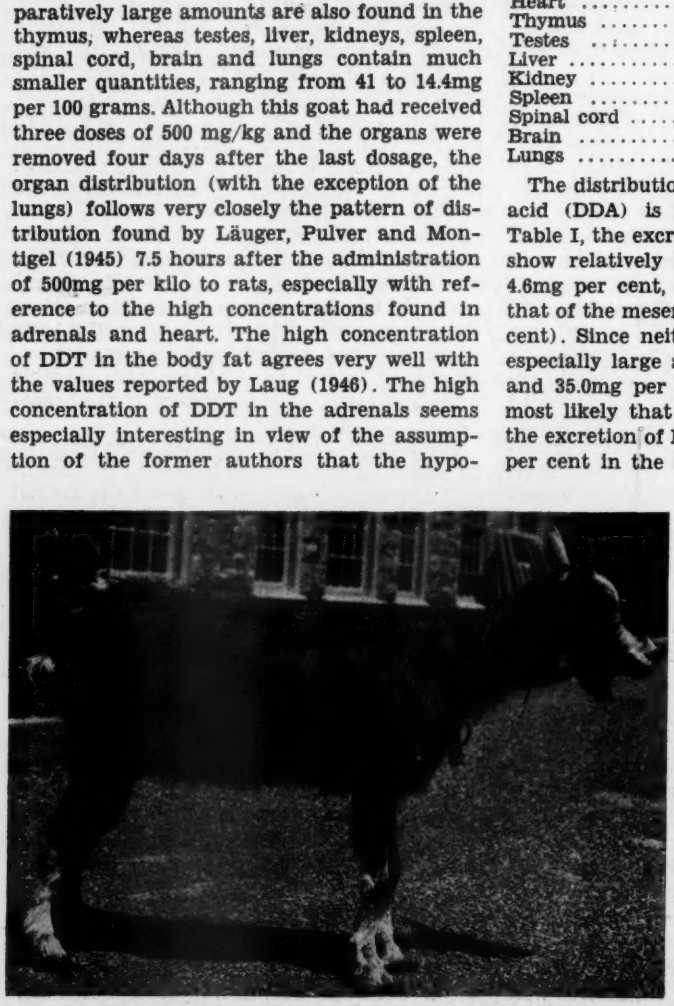
The distribution of DDT in the organs and also that of di(p-chlorophenyl) acetic acid (DDA) was studied in one goat after three oral doses of 500mg of DDT per kilogram of body weight in vegetable oil given three and four days apart by means of the Schechter-Haller reaction (1944) using the procedure described by Ofner and Calvery (1945), all determinations being made in duplicate or triplicate. The color density readings were made on a Coleman Universal spectrophotometer. Although DDT and DDA, as such, were not

positively identified in these tissues, the specificity of this color reaction coupled with the extraction and separation procedure indicates the presence of these two compounds beyond reasonable doubt. Application of this procedure to normal goat tissue gave negative tests for DDT and DDA. Furthermore, while the possibility of the presence of small amounts of unknown metabolites cannot be categorically denied, such metabolites, if any, are certainly not there in amounts large enough to interfere with the determinations. The results are given in Table I, and show that by far the largest quantity of DDT is stored in the fat tissue; the lymph nodes contain about one-quarter as much and similar amounts are found in the adrenals and the heart. Comparatively large amounts are also found in the thymus, whereas testes, liver, kidneys, spleen, spinal cord, brain and lungs contain much smaller quantities, ranging from 41 to 14.4mg per 100 grams. Although this goat had received three doses of 500 mg/kg and the organs were removed four days after the last dosage, the organ distribution (with the exception of the lungs) follows very closely the pattern of distribution found by Läuger, Pulver and Montigel (1945) 7.5 hours after the administration of 500mg per kilo to rats, especially with reference to the high concentrations found in adrenals and heart. The high concentration of DDT in the body fat agrees very well with the values reported by Laug (1946). The high concentration of DDT in the adrenals seems especially interesting in view of the assumption of the former authors that the hypoglycemic action may be due to an increased output of epinephrine and because Philips and Gilman (1946) also assume that in severe DDT poisoning there is an increased sympathetic stimulation. The high concentration of DDT in the heart is also of interest because Philips and Gilman (1946) have shown that DDT sensitizes the heart to sympathetic stimuli.

TABLE I.—DISTRIBUTION OF DDT AND DDA IN THE ORGANS OF A GOAT AFTER THREE ORAL DOSES OF 500MG/KG OF DDT DISSOLVED IN OLIVE OIL, FOUR DAYS AFTER THE LAST DOSE

| Organ | mg percent DDT | DDA |
|---|---|---|
| Omentum fat | 1121. | — |
| Lymph nodes, mesenteric | 306.8 | 8.4 |
| Adrenals | 287.7 | 3.1 |
| Heart | 267.0 | 1.5 |
| Thymus | 162.8 | 2.2 |
| Testes | 41.0 | 1.5 |
| Liver | 35.1 | 4.6 |
| Kidney | 21.5 | 7.1 |
| Spleen | 18.4 | 1.4 |
| Spinal cord | 17.4 | 1.2 |
| Brain | 15.5 | 1.7 |
| Lungs | 14.4 | 1.4 |

The distribution of di(p-chlorophenyl) acetic acid (DDA) is interesting. As illustrated in Table I, the excretory organs, kidney and liver show relatively high values, namely 7.1 and 4.6mg per cent, which are surpassed only by that of the mesenteric lymph nodes (8.4mg per cent). Since neither kidney nor liver contain especially large amounts of DDT, namely 21.5 and 35.0mg per cent, respectively, it appears most likely that these organs are the site of the excretion of DDA. The high value of 8.4mg per cent in the mesenteric lymph nodes may indicate that some formation of DDA takes place in the gastrointestinal tract. The low concentrations of DDA in the adrenals, heart and thymus, 3.1, 1.5 and 2.2mg per cent, respectively, contrast markedly with the high concentrations of DDT in these organs which are 287.7, 267.0 and 162.8mg per cent, respectively. Since both heart and adrenals play a role in the toxic effects of DDT on the circulation, as demonstrated by Philips and Gilman (1946), it appears questionable whether the degradation of DDT to DDA plays a role in the toxic action of the former. It is surprising that the organs which are responsible for the most char-



An animal in poor condition does not tolerate DDT as well as a fat one

acteristic manifestation of DDT, namely the brain and the spinal cord, are low both in DDT and in DDA, the concentrations of the former being 15.5 and 17.4mg per cent and of the latter 1.7 and 1.2mg per cent, respectively.

## Summary and Conclusions

1. It was shown that following the oral administration of 50 and 100mg/kg of DDT in olive oil for 55 days to a lactating goat, quantities of 0.5 to 1.0mg/gm were excreted with the milk, DDT being dissolved in the fat globules of the cream.

2. The single, fatal, oral dose of DDT in vegetable oil for goats is greater than 1000mg/kg.

3. Such doses may be tolerated repeatedly before the animals succumb to DDT poisoning; their susceptibility depending largely upon the amount of body fat.

4. The toxicological picture and the histopathological changes of goats poisoned by repeated oral doses of 1000mg/kg of DDT in vegetable oil correspond to those reported in other animals. However, the toxicological picture was slower to develop in goats than observed in mice, rats, rabbits, cats, and dogs.

5. The distribution of DDT and DDA in various organs of one goat was studied. By far the largest amount of DDT was found in the fat, followed by smaller amounts in the mesenteric lymph nodes, adrenals, heart and thymus. Testes, liver, kidney, spleen, spinal cord, brain and lungs contained much smaller quantities ranging from 41 to 14.4mg per cent. The distribution of DDA follows a different pattern. The concentration of DDA was highest in the mesenteric lymph nodes, followed by kidney, liver, and adrenals, the other organs containing much smaller quantities, all being of the same order. The interpretation of these findings is discussed.

## Acknowledgement

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# Swine Brucellosis*

THERE is an interesting history back of the research into swine brucellosis which has been carried on at the Purdue Agricultural Experiment Station for a number of years. Claude L. Wickard, former Secretary of the USDA, had the disease among the swine on his farms. He himself contracted the disease, as did also his tenants. A point was reached where he could no longer obtain tenants to operate his farms. Returning from a six-month sojourn in Chicago hospitals where he had undergone treatment for brucellosis, Secretary Wickard was able to convince the Congress that the disease in swine poses both economic and public health problems of great importance and to obtain an initial appropriation of $50,000 for the study of it.

This sum was divided and allotted to several state experiment stations, including the Purdue station. We began our study by acquiring an infected herd and giving it only the usual care that a farm herd gets. No attempt was made to interfere with the natural course of the disease. We just watched it to see what would happen. The bovine brucellosis control project was begun without sufficient experimental data as to what would happen in an infected herd if nothing whatever was done about it, *i.e.*, if the disease were just allowed to pursue its natural course. Hence when we instituted control measures in a herd, and after a few years the disease was eliminated, we didn't know whether we had accomplished something or whether the disease would have died out in the same time if we had done nothing at all. Likewise when we failed to free a herd from brucellosis or a herd under supervision was reinfected we didn't know whether the plan was inadequate or our methods were at fault, or whether the mischance was due to the nature of the disease.

As a result of controlled research, correlated with a clinical observation of infected farm herds, we have accumulated information as to what swine brucellosis will do when it gets into a herd if nothing is done to combat it. When control measures are instituted and the situation in the herd changes we are in a good position to evaluate the effect, if any, of the control measures we have employed.

Although *Brucella abortus* and *Brucella suis* are closely related species of the same genus, there are marked differences between bovine brucellosis and swine brucellosis. When the bovine type enters the body of a susceptible animal it circulates in the blood for a short period only, and then localizes in the uterus or udder. The suis type, by contrast, circulates in the blood for a long period, often 60 to 90 days and then may localize in any tissue—muscle, bone, nerve, skin or connective tissue, in the reproductive organs, liver, spleen, gall bladder, etc. This is important from a public health aspect. Since the uterus and udder are not used for food there is practically no danger to man from the consumption of beef from an animal infected with *Br. abortus*. The case is quite different with pork, since edible portions of an infected animal may endanger the butcher and the housewife, who handle the meat.

There is some difference in the diseases caused by the two types of organisms. In cattle abortion is sufficiently consistent to have given the name contagious abortion to the disease, over a long period. In swine the abortion phenomenon is most variable and seems to depend to a considerable extent upon the time of infection. Abortion has not been recorded as a result of infection of the open gilt or sow, nor of the animal late in the gestation period. Abortion frequently, but irregularly, occurs as a result of infection at the time of, or near, breeding. Further, sows rarely abort more than once. This often misleads the swine owner. He has many abortions in his herd for a season and thereafter few or none, and he thinks he has got rid of the disease, possibly as a result of giving his sows some alleged remedy. However the disease is still with him. The sows having aborted once do not abort again, but they may infect their weanling pigs and the open gilts, which in turn do not abort but infect succeeding crops of pigs and open gilts.

Another difference is in the way the disease affects the males in the two species. Bulls are not commonly infected. Even in badly infected herds it is not unusual to find the bulls to be non-reactors. Boars on the other hand are highly susceptible. They may not be any more susceptible than sows but since they commonly run with the herd and because of their nature, they may be more exposed to infection than other members of the herd. The percentage of infected animals is higher among boars than it is among other swine.

The infected bull rarely disseminates the infection. He seldom, if ever, infects the cow at the time of breeding. In an experiment conducted in Minnesota, infected bulls failed over an eight-year period to infect susceptible cows, when their only contact with them was at breeding. In sharp contrast to this the

*Notes from an informal discussion of this subject by Dr. L. M. Hutchings, at a monthly meeting of the Greater St. Louis Veterinary Association June 6, 1947.

boar is an important spreader of the infection. His semen frequently contains Brucella organisms in inconceivably large numbers. Breeding a susceptible sow or gilt to such an animal is one of the surest methods known, of infecting her. It is as certain as instillation of the organisms into the conjunctival sac.

Orchitis is a common symptom of brucellosis in swine. Occasionally both testicles are involved and enlarged, but more often only one testicle is affected. The affected testicle is much enlarged giving the scrotum a marked asymetrical aspect, when viewed from the rear of the animal. When this symptom is present in the herd boar it justifies a suspicion that the herd is infected.

Symptoms of swine brucellosis, other than those involving reproduction, are: lameness, abscess formation and posterior paralysis. The lameness may involve any of the joints of the locomotory organs and rather commonly affects only one joint at a time. Suis is the only species of Brucella that produces pus. It often produces abscesses in the liver, spleen, subcutaneous and other tissues. The pus in such abscesses usually contains a pure culture of the organisms. These abscesses may be large and persist for years; rupturing from time to time and contaminating the environment with the organisms.

The posterior paralysis caused by brucellosis is due to involvement of vertebrae or intervertebral discs, usually in the lumber region. It is characterized by a slow onset and slow progress from a staggering gait and knuckling to complete paralysis of the hind legs, and inability of the animal to stand when lifted to her feet.

Brucellosis in swine resembles the disease in man far more than the disease in cattle. There is one important difference however—the disease in swine is afebrile whereas in man there is an undulating temperature reaction.

Porcine brucellosis is a self limiting disease. It may exist in a herd for a long period, but the individual animal tends to recover. Because of this characteristic of spontaneous recovery, the swine raiser may not be much concerned about the presence of brucellosis in his herd. However, if the danger to himself and family and to his hired help is explained, his interest is quickly aroused.

Among cattle, brucellosis susceptibility varies greatly with the age of the animal. Calves to the age of six months, as is well known, possess almost complete immunity to natural infection and, as has been mentioned, bulls at older ages are less commonly infected than females. Among swine, on the other hand, there is almost no age-variability in susceptibility. Pigs, to the age of weaning, are perhaps somewhat more resistant than older swine, but even pigs may be infected readily at one week of age or younger. Unlike bulls, boars are highly susceptible. In one respect cattle and swine react the same way to Brucella infection; a good many individuals of both species possess sufficient immunity to prevent natural infection, however close may be their association with infected animals. For some unknown reason they just don't acquire the disease.

In swine brucellosis infection is almost exclusively from animal contact. Infection from the premises seldom occurs. There is fair evidence that aborted fetuses or infected placentas may infect streams, which might convey the infection to another farm; but the *Br. suis* is a tender plant that doesn't survive long outside the living tissues of its host, except in the frozen state. Sows that abort eliminate the organisms in genital discharges for from three to 51 days, usually for two to three weeks, but the organisms are short-lived on feed or other material contaminated by such discharges. An exposure of 4½ hours to direct sunshine kills them.

The diagnosis of brucellosis in swine is based primarily upon the agglutination test, the same as in cattle, and the same antigen is used. We have made numerous comparative tests with the B. A. I. antigen and an antigen which we prepared from *Br. suis* organisms and found no essential difference in the reactions to the two antigens. Unfortunately in swine the agglutination test is not dependable in the individual animal. Its value lies in its use as a herd test. Fifteen to 20% of the infected animals fail to react. Nor is the reaction when obtained consistent. A long period may, and usually does, elapse between the time of infection and the time when the serum begins to react to the agglutination test. Further the animal may react for a period up to four months and then suddenly cease to react while still infected and eliminating organisms in the discharges. Animals in which walled-off abscesses develop seldom react, although such abscesses may rupture from time to time and discharge pus containing a pure culture of *Br. suis*. In its reaction to the agglutination test brucellosis of swine closely resembles the disease in man, where 16% of the cases from which the organisms can be isolated, react negatively.

As a herd test, the agglutination test is of great value. We test all the breeding animals in the herd and if we get a few good reactions, 1:200 or upwards, we consider all the breeding stock infected and proceed from that premise. If we obtain no reactions at a higher

titer than 1:50 we disregard them and consider the herd as being free from the disease, *i.e.*, where the diagnosis is based upon the agglutination test alone. Of course if there is an opportunity to visit the herd, the history, particularly of any abortion or low-breeding efficiency, and the symptoms of lameness, paralysis and unilateral orchitis is taken into account, along with the result of the agglutination test in arriving at a diagnosis.

Various methods of controlling or eradicating brucellosis in swine have been tried. Briefly, no success has attended the employment of chemotherapy or antibiotic agents. We have not tried Strain 19 vaccine, but at the B. A. I. station at Beltsville they say it is of

**Brucella orchitis in a Purebred Poland China boar. This is an exaggerated case. Usually the disparity in the size of the affected and the non-infected testicle is not so great. The agglutination titer of this animal at the time the photograph was taken was 1:25600. *Vet. Med.*, Mch., 1937, p. 113.**

no value in swine. A vaccine which has been prepared from a suis strain of low virulence possesses some value as a prophylactic but is highly virulent for man and that rules out the employment of it.

A plan of brucellosis control and eradication in infected herds of swine, that has been successful in most instances in which it has been employed, is as follows:

The pigs are given the agglutination test at eight weeks of age. Those that do not react are weaned and removed to clean ground. They are tested two more times before breeding and the reactors are returned immediately to the infected herd, which is retained only until a sufficient number of negative reactors are raised to take its place. The infected herd is then slaughtered at an abattoir operating under federal inspection.

## Foot-and-Mouth Disease Battle May Be Transferred to Border

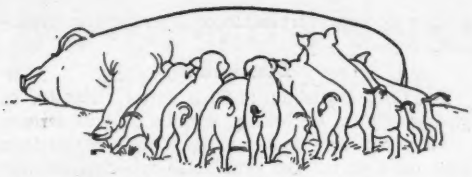
At the end of June the $9,000,000 appropriated by the Congress to combat the present outbreak of foot-and-mouth disease in Mexico was all spent. Two of the most northerly isolated centers of infection had been pinched out, but no progress against the main center of mass infection could be reported. The infected area is equivalent to 300 U. S. counties.

Washington officials are reported, by the press services, to be much discouraged by this lack of progress, and to contemplate giving up the fight in Mexico and concentrating on halting the northward progress of the disease at the Border. Probably not all the reasons for the pessimistic attitude toward eventual eradication of the outbreak is given. However, it is reported that the climate and conditions under the work of eradication is conducted are almost unbearable for American veterinarians. Further the attitude of the cattle ranchers in Northern Mexico is giving officials grave concern. Closing the Border more than a year ago wiped out the market for their cattle. Many of these ranchers are in serious financial straits and demand that the United States supply a market or they will infect their herds and thus force the authorities to buy and slaughter them. The only apparent solution is to induce some of the large Chicago meat packers to open meat canning establishments south of the Border.

In retrospect the wisdom of deciding against the use of foot-and-mouth vaccine may be questioned. The effectiveness of radical slaughter as a means of eradication is not open to question under U. S. conditions. But it is not a plan that lends itself to temporizing. It requires slaughter and burial of all affected and exposed, susceptible animals. This was not done in Mexico. Motion pictures are being shown in this country of clinically affected animals in public stock yards and in abattoirs, and of great stacks of cattle feet, showing extensive lesions, lying on abattoir floors. True the photographs were taken three months ago but they show that the carcasses of many thousands of clinically affected animals went into channels of trade, thus disseminating and perhaps still spreading infection widely.

A wide spread outbreak of foot-and-mouth disease in the vicinity of Rome at the close of hostilities was quickly brought under control by means of vaccination by American Army veterinarians, in spite of the greatest of difficulties of travel and organization. The radical slaughter plan was deemed completely inapplicable under the conditions obtaining there. Perhaps it is inapplicable in Mexico.

# Gastroenteritis in Young Pigs



FOUR years ago veterinarians at the Purdue Agricultural Experiment Station were requested to investigate heavy losses in young pigs, that were occurring on an Indiana farm. Upon arrival at this farm it was noted that it was much better equipped for swine raising than the average farm and was intelligently managed. The sanitary arrangement and practices in particular being about as near ideal as can be found in commercial swine-raising enterprises.

The sows in this herd had been bred to farrow over only a short period and they were farrowing at a rate of two to four daily. All farrowings were in a well-constructed, sanitary farrowing house. The pigs were born apparently vigorous and healthy. Within a few days they developed a peculiar diarrhea. It was unusual in that all members of the litter developed it at approximately the same time, the pigs retained their appetites and remained active almost to the end, the fecal discharge was pure white and appeared to be unaltered milk and the mortality was practically 100% in 48 to 72 hours. As would be expected in pigs of this age dehydration was very rapid and may have been in considerable part responsible for the death, however, a fatal termination was not long delayed by injection of saline or dextrose solutions. The ailment was recognized as different from any of the baby pig ailments with which we were familiar.

Attempts were made to improve the disinfection of the farrowing pens, before the sows were put into them and to isolate them completely one from another, but the disease continued unabated. Then the sows were permitted to farrow out in the field, although the weather was unfavorable for that. From these sows the farmer raised 80 pigs, which constituted his total crop although 390 pigs were farrowed. He has suffered no further loss from this ailment in the intervening seasons.

This ailment of pigs has been under more or less continuous study at the Purdue station since that first outbreak. However, not a great deal has been learned about it. It poses a difficult problem for study, because one very quickly runs out of pigs. If an ailing pig is placed in a litter, the whole litter is dead in a few days and that study ends. Controls under the same conditions as the experimental pigs are difficult to arrange, since if there is one affected pig in a farrowing house all pigs may acquire the disease, no matter how strict the isolation.

It has been determined that this ailment is essentially a superficial enteritis. The most constant lesion is a large amount of fluid intestinal content of whitish, yellowish or greenish color. Marked engorgement of the mesenteric blood vessels is usually present as is also hyperemia of the gastric and intestinal mucosa. The kidneys may show degenerative changes and often contain urates. Gross evidence of gastritis and enteritis is not always apparent. The disease is easily communicable by ingestion or injection of the fecal discharge, either unaltered or filtered.

Pigs, contracting the disease when they are under 10 days of age, practically all die, those infected at two to three weeks of age and older, mostly recover but are stunted. Swine of all ages are susceptible. Shotes practically all recover and suffer little harm from an attack other than considerable loss of weight. When the infection appears in a litter of pigs the sow also may acquire it. She will vomit and have a profuse diarrhea, but recovers in about four days. Other symptoms in the sow are weakness, loss of appetite, acute grunting and decreased milk secretion; sometimes complete suppression of the milk flow. Having had one attack, sows have not been affected a second time, nor are subsequent litters affected as a rule. An experiment is contemplated at the present time in which gilts are to be infected at breeding time in the hope that their colostrum may protect their litters when they farrow.

We have carried this infectious agent serially through 32 litters of pigs, and have preserved it in frozen gastrointestinal tract for 13 months. Under natural conditions it does not survive on the premises from one farrowing season to the next.

Outbreaks of this disease have occurred sporadically in Indiana since the first one four years ago and each season the outbreaks have been more numerous than in the preceding one. During the past winter reports of the occurrence of this ailment have reached us from several other states. The loss appears to have been heavy in Iowa. No drug, serum, or vaccine so far tested has been efficacious

*Notes from an informal discussion of this subject by Dr. L. M. Hutchings at a monthly meeting of the Greater St. Louis Veterinary Association, June 6, 1947.

either as a prophylactic or therapeutic measure.

### Discussion

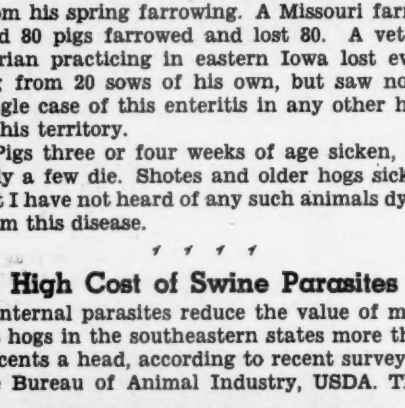
Dr. Guy Railsback: This virus enteritis of young pigs is becoming serious. I was in one county of Iowa last spring where 50,000 pigs had died of it. On one farm where approximately 400 pigs were farrowed just two survived. While losses have been heaviest in Iowa I think the disease occurred also in northern Missouri, southern Minnesota and in South Dakota last season.

Dr. J. D. Ray: This virus appears in a herd apparently from "nowhere" and, in most instances, proceeds to kill all pigs farrowed on the premises from that date on. One Nebraska farmer that I know of lost every pig from 45 sows. Believe it or not he did not raise one pig from his spring farrowing. A Missouri farmer had 80 pigs farrowed and lost 80. A veterinarian practicing in eastern Iowa lost every pig from 20 sows of his own, but saw not a single case of this enteritis in any other herd in his territory.

Pigs three or four weeks of age sicken, but only a few die. Shotes and older hogs sicken, but I have not heard of any such animals dying from this disease.

## High Cost of Swine Parasites

Internal parasites reduce the value of market hogs in the southeastern states more than 50 cents a head, according to recent survey by the Bureau of Animal Industry, USDA. That



**The McLean County system of swine raising was developed to keep young pigs out of permanent hog lots such as this**

amount is the approximate direct loss caused by condemnations of parasitized livers, kidneys, casings, and affected parts of the loin and other cuts, in establishments operating under Federal meat inspection. Although the immediate loss falls on packing establishments, farmers pay for it through lower prices received for their hogs. There are additional farm losses, too, in the form of deaths, retarded growth of hogs, and increased feed costs.

## Recent Research in Britain Has Determined That—

Concentration of equine semen by centrifuge is definitely conducive to the preservation of the spermatozoa.

Ice applied to the scrotums of rabbits and rats for 20 minutes resulted in the ejaculation of 20 to 30% of disintegrated spermatozoa over a period of 10 days.

Lactation in heifers due to implantation of 50, 50mg tablets of diethylstilbestrol is variable in amount. By comparison with subsequent normal lactations, production may fall far below normal in some individuals and approximately equal it in others.

Heat can be induced in goats during the summer period of anestrus by the injection of pregnant mare serum (600 to 2000 i.u.). By this method they can be bred to deliver kids from September to November and thus produce milk during the winter. When mated during this summer estrus the conception rate is lower than from mating at the usual season for breeding.

### Nutritional Studies

Concentrated cooked garbage is utilized satisfactorily in the ration of sheep.

Beet pulp and molasses, as supplementary feeds, in the ration of bacon swine produced a flabby unsatisfactory product lacking in depth and finish.

Swine can use dried potato products in the ration more efficiently than sheep. The potatoes should be flaked or sliced; potato meal being of decidedly less value for both swine and sheep.

The most efficient conversion of animal feeds into human food is obtained in milk with veal as a by-product, in eggs with poultry meat as a by-product and in lambs finished on grass, in the order named. The cows, hens, and ewes must be bred for high production.

Though poultry eat raw potato readily they do not digest it well. Boiled potatoes are readily utilized by fowl; one pound of boiled potatoes being equal to five pounds of raw potatoes as poultry feed. Satisfactory production was attained by an experimental flock on a ration consisting of four parts by weight of cooked potato to one part of a cereal food-fish meal mixture.

# Infectious Venereal Granuloma in Greyhounds

By LOUIS N. GLEASON, M.R.C.V.S.
Waterford, Ireland

DURING recent years the prevalence of infectious venereal granuloma in greyhounds has increased in Ireland. This is probably due to the increased breeding of these dogs.

The disease is readily transmissible. Apparently it is due to a virus. This belief was expressed in the report to the Imperial Cancer Research Fund (1905) and subsequent observations have strengthened that opinion.

Infection occurs during coitus if either partner to the mating has macroscopic lesions on the genitals. Contamination of the genitals and infection may occur also in the case of animals licking infected genitals and then licking their own organs or those of another susceptible animal. The writer has seen a whole litter of puppies, both male and female, infected in this way by an infected dam.

Infectious venereal granuloma affects all parts of the genitals of the male and female that contact during coition, except the skin of the vulva and scrotum. Although much licking of affected organs takes place, infection of the buccal or nasal mucosa has not been noted. Any part of the penis may show lesions, but they are most common at the base. In the female, lesions may occur on any part of the mucous membrane of the vulva or vagina but they are more common in the vulva and fossa clitoridis and on the clitoris than in the vagina.

Experimental transmission of the disease, by the author, using submucous injections of a saline suspension of tumor cells, showed all common breeds of dogs to be susceptible. The incubation period, from exposure to the appearance of macroscopic lesions is apparently not less than three nor more than six weeks.

In bitches the disease is usually discovered after whelping, but it may be noted earlier where a granuloma develops near the vulvar commissure and is visible externally. Or it may be discovered when it is noted the bitch is bleeding but not in heat. In the male it is usually discovered in the early stages, due to the bleeding from the prepuce and observation of the protruded penis by the stud attendant.

### Diagnosis

In the case of the dog, diagnosis is simple, the animal is placed upon his side and the penis fully exposed, whereupon both penis and sheath are carefully examined, no area of the mucous membrane passing unscrutinized. It is necessary to differentiate between a normal, spotty, granular appearance of the base of the penis and the early stage of venereal disease. The conditions appear alike, but when the finger is rubbed over a suspected area, a spotty condition due to venereal disease bleeds readily, thus removing doubt as to the abnormality of the condition. The more established the disease, the easier the diagnosis. In the case of large separate tumors or clumps of the latter the diagnosis is obvious. In both dog and bitch, two types of the disease are seen, one I would classify as being decidedly more benign than the other. One meets a condition of somewhat pedunculated tumors, occurring separately or in clumps. They are relatively slow-growing and easily dealt with. They occupy only a small area of mucous membrane at the base and are accompanied by little or no submucous inflammation. The other type of venereal disease consists of a spreading, sessile growth and causes an adhesive, inflammatory infiltration of the submucosa, which renders surgical treatment more difficult.

In the bitch diagnosis may be easy where bleeding apart from heat is noticed, and eversion of the vulvar lips exposes the raw tumor or tumors. On the other hand where the lesion is in the anterior vagina accurate diagnosis will require the use of a speculum and a strong beam of light. In many cases digital examination of the posterior vagina and vulva is sufficient to reveal disease; where one feels an abnormal swelling within and withdraws a bloody finger the deepest suspicions are justified and a speculum may be applied to clinch diagnosis. In some cases, however, the lesions are situated in the anterior vagina, adjacent to the upper or lower fornix, the maxim therefore is always to use the best possible vaginoscope and to leave no area of mucous membrane unexamined; working from within outward during the examination. A small human coldlite proctoscope is a useful instrument. Visibility with it can be much improved by using a human laryngeal speculum in conjunction with the proctoscope. Where there is reason to suspect infection, fortnightly examinations are necessary and sufficient to detect early stages of the disease. Speaking generally, where infection is present, in a not too advanced state, there is little interferrence with general health. As the condition becomes advanced, however, with the formation of extensive bulky granulomata, which are followed by ulceration, bleeding, and secondary bacterial invasion, the symptoms of anemia and toxemia become apparent. The patient loses weight, assumes an anxious expression, due to mechanical discomfort and gives off an obvious stench from the decaying tumors.

### Laboratory Examination

Histologically, the venereal granuloma resembles a roundcell sarcoma.[2] It is believed by some observers that intracellular bodies (inclusion bodies) exist, but confirmation is lacking. The stroma present is better developed than in the common, malignant, round cell sarcoma. The writer has noted encapsulation varying from incomplete, to complete in some cases. Sections of the latter growths reveal an outer periphery of well developed fibrous tissue, becoming more soft and sarcomatouslike toward the center where the cells are still embryonic fibroblasts in appearance.

### Treatment

Up to the present, treatment is entirely surgical. Procedure will depend upon the site of the lesions, type of infection and size of tumors. In all cases, surgery is under complete general anesthesia, in both dog and bitch. Where extensive excisions are necessary, regional submucous infiltration of the diseased area with a hemostatic agents such as thromboplastin is necessary in order to control hemorrhage.

*In the Dog.*—Mild and medium cases of either pedunculated or sessile type of disease can be dealt with successfully at a single operation. Complete excision of the tumor is necessary. By means of very sharp, small-jaw scissors, a section of the parent mucous membrane is removed leaving clean penial edges. In the case of pedunculated growths the tumor is clamped at its base in a wide-jaw hemostat, the tissues in jaws of the forceps consisting of mucous membrane, which is incised at the penial side of the instrument. Close suturing of the loose gaping edges of mucous membrane with fine catgut is necessary, and must not be neglected in penial operations. In the case of advanced disease with extensive sessile or cauliflower-like growth, the treatment is carried on in one, two or more operations, at fortnightly intervals. Where excision has been complete, recovery is 100% complete and permanent, and in no case, except in reinfection* has recurrence been noted. In some cases in the dog where sheath infection is extensive, division of the median raphe is necessary to complete the excisions, close suturing here, on an extensive scale is not advisable if there be likelihood of subsequent sheath stenosis.

Post-operative treatment in the dog consists of painting the incisions with 1% gentian violet, subsequent douching with a mild antiseptic solution, such as 5% chloroxylenol and terpineol once daily, followed by injection of an oily sulfa ointment. The dog should be kept under bromides for a few days after the operation, underfed and kept away altogether from contact with bitches. Healing time is much delayed by half-erection or sexual stimuli.

*Treatment in the Bitch.*—This may vary from simple removal of early vulvar lesions, to a major operation or operations, rendered necessary by the presence of extensive lesions in the middle or anterior vagina. A headlamp worn by the operator and a narrow bladed speculum are invaluable instruments. For the successful removal of lesions situated from near the os to the posterior third of the vagina, division of the upper and lower vulvar commissures is necessary. In sectioning the upper commissure, a light incision, passing through skin and mucous membrane only, is first made, then the division of the lips is enlarged by a little tearing and blunt dissection. In this way the vulvar veins will be exposed and may be either ligated or stretched as seems necessary.

Deep incision into the substance of the upper vulvar commissure should be avoided, as apart from venous hemorrhage, arterial flow will result, creating difficulties at an early stage of the operation. The lower commissure is incised similarly through skin and mucous membrane exposing the fossa clitoridis. The incised tissues are stretched. Apart from deep seated lesions in the vagina, disease of the fossa renders incision of the lower commissure and exposure of the fossa clitoridis necessary in order to dissect out the infected mucous membrane. Semi-obliteration of the cavity follows this procedure. The incised vulvar lips, now in the nature of flaps, are seized, using vulsella forceps, and drawn apart by assistants. Lesions in the middle and posterior thirds of the vagina can now be inspected, seized and efficiently dealt with. The narrow bladed speculum will be found necessary in order to deal with far-in tumors, which may be grasped and regrasped with angular jaw forceps until a satisfactory grip is obtained, when the growth is drawn out as much as possible before excision. At the latter stage it is a good plan, before excising the tumor, to run in a couple of catgut strands through the mucous membrane pedicle on the vaginal side of the forceps ready for tying after the tumor is removed. Various devices have been used to check hemorrhage following excision, such as an electrically heated loop of platinum wire used to excise the tumors, but my experience in this connection is, where the tumors are extensive and deeply placed, one may do damage with cauteries giving rise to stenosis afterwards. The submucous injection of a

*Reinfection has not been noted within 12 months following recovery from a previous attack, hence it seems reasonable to surmise that an attack confers at least a partial immunity for this period.

hemostatic agent, together with either ligating or approximating incised mucous membrane and followed by a vaginal plug if necessary will usually be found satisfactory after operation. The approximation of internal incised edges by stitches calls for neat use of a small curved needle and a holder such as a human gall bladder needle holder. Of late, I have found Singer's surgical stitcher to be very useful in placing far-in sutures. If, however, due to one difficulty or another, such as a very small bitch, anterior vaginal incisions cannot be stitched, one need not worry, as with proper after care healing will be rapid and complete. If, when one has seized, in the forceps, an anterior vaginal lesion by its mucous membrane base, and the impossibility of stitching or ligature is feared, a strong jawed suitably shaped hemostat should be applied tightly on the vaginal side of its fellow already *in situ,* and left for a short while. It may then be removed and the incision made through the crushed tissues. Where stitching after excision is at all possible, this procedure should be followed, particularly where opposing raw surfaces are present in the vagina. Following the vaginal operation, the sectioned vulvar commissures are approximated with both deep and superficial sutures as seems necessary. Where extensive disease has been present in the vagina and/or vulva and, at a later date, a second operation is considered necessary to complete the excisions, it goes without saying that the lesions in the anterior and middle vagina should be dealt with at the first operation. Posterior and vulvar lesions will be removed at the second operation in which reopening of the commissures of the vulva may not be necessary. Where the type of lesion met with in a bitch, is the semifibrous, pedunculated tumor, and where the latter is present extensively in the passage, total removal of the tumors and cleaning of the vagina may be undertaken at one operation. In the latter case the individual excisions, although perhaps involving a large number of pedunculated growths do not give rise to any hemorrhage of moment as the amount of mucous membrance removed is small and almost in every case a single ligature is sufficient. Where extensive sessile growth is present, however, it is necessary to attack the disease in stages, usually two operations being necessary to complete the treatment.

### Post-operative Treatment

When an animal has been subjected to a long operation involving extensive excisions, it is desirable to give a saline transfusion before anesthesia has passed off and, again, six hours later, or as seems necessary.

In the case of the bitch, particularly where total approximation of the incised mucous membrane by stitches has not been possible, and where raw opposing surfaces exist in the vagina, post-operative treatment is most important. The type of dressing used twice daily, should consist of a sulfanilamide cream (10% sulfanilamide with oleum morrhuae). A syringe with a long metal nozzle should be used, so that the greasy dressing will reach anterior incisions, thus keeping opposing raw areas from adhesion with subsequent stenosis of the passage. The vaginal mucosa heals rapidly and even following the most extensive operation, B.I.D. ten-day treatment is sufficient. For a week following the operation a maintenance dose of sulfa drug, orally, is desirable. External commissural incisions should be dressed with mild tincture of iodine.

*Results.*—Except in the case of far advanced disease, where operative procedures have been extensive with possible stenosis, removal of venereal granuloma in the greyhound bitch is followed by excellent results, the surgical procedures when correctly carried out neither interferring with the health or breeding of the animal. In a few cases, where after treatment left much to be desired, I found it necessary to break down, manually, collateral adhesions which had formed in the vagina.

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1. (V.M.A.I. circular) addressed to veterinary profession in Ireland.

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## Greyhound Racing

The growth in popularity of greyhound racing has been so rapid [in Britain] that there are many still quite ignorant of the organizations which control this national pastime.

The National Greyhound Racing Club is the equivalent in greyhound racing of the Jockey Club in horseracing. All owners of greyhounds wishing to race under the rules of the club have to be registered with the club as do their greyhounds. Only greyhounds registered in the English and Irish stud books are eligible for registration with the National Greyhound Racing Club. All racecourses wishing to race under the rules have to receive a license from the club and all officials of racecourses including veterinary surgeons, trainers and kennelmaids have to obtain licenses from the club.

The veterinary surgeon attending a greyhound racecourse needs to be not only a good clinician, but a man able to make quick and sound decisions, and of sufficient strength of character to maintain them.—H. KIRK in *Vet. Rec.*

# Phenothiazine Poisoning in a Farm Dog

By LILLIAN EICHELBERGER, PhD.* and MICHAEL ROMA*
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THIS report of a case of phenothiazine poisoning in a farm dog is of special interest and value not only because of the symptoms developed as a result of the drug but also because of the reversibility of the processes involved. Eight weeks were required before recovery occurred from the generalized polyneuritis to a degree sufficient to permit walking.

Since phenothiazine is widely used as the ideal anthelmintic for farm animals, notably sheep,[1] the chances of farm dogs obtaining this substance are increasing. Since this drug is distributed through feed stores, drug stores and other dispensing centers, the farmer is often led to believe that the drug is innocuous and leaves it where dogs, cats or chickens have

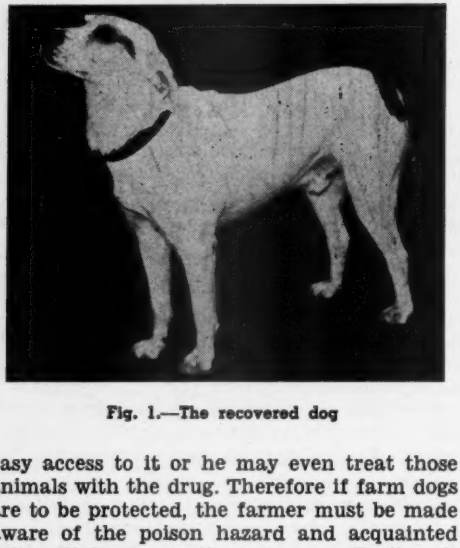

Fig. 1.—The recovered dog

easy access to it or he may even treat those animals with the drug. Therefore if farm dogs are to be protected, the farmer must be made aware of the poison hazard and acquainted with suitable preventive measures. Further it is important that veterinarians be fully aware of the possibility of phenothiazine poisoning in dogs, the symptoms and the prognosis.

This report describes a case of phenothiazine poisoning in a male dog, eight years of age and of approximately 18kg body weight. The amount of the drug consumed by the dog is unknown, but it is probable that it was obtained from an open sack of the drug left in the corner of the barn. The first signs and symptoms, noticed by the owner, were a peculiarity of gait of the dog and an incoordination of the hind legs, followed hours later by dragging the hind legs and a posterior paralysis. The next day the front legs also were paralyzed. Three days later the dog had lost all body reflexes and was completely paralyzed. During these days the dog had no food or water, since, he was unable to drag himself to his food and drink. At this stage he was brought in to the laboratory from the farm for treatment.

### Laboratory Findings

The appetite was not impaired but the dog could consume food only when it was placed to the mouth, for the head could not be moved voluntarily. He drank water freely when it was injected with a syringe into the mouth. The lap reflex was unimpaired.

The drug apparently was eliminated spontaneously for at least three or four days following consumption of the drug, judging from the red dyeing of the hair on one side of the dog and by the thionol[2] compound excreted in the urine. Later urine could be obtained only by catheterization. For the first week the urine removed by catheter turned red after exposure to air; after the second week an intense orange-yellow compound was excreted. The excretion of this dye persisted for weeks, staining yellow the hair of the animal or any other material which the urine contacted. The feces obtainable by enema were admixed with large amounts of this conjugated yellow compound. The specific gravity of the urine ranged from 1.040 to 1.050 even following intravenous injection of isotonic sodium chloride solutions. The high specific gravity was probably due to the high concentration of the excreted dye. The excretion of dye was continued for at least six weeks, which strongly suggests that the dye had been stored in the tissues of the body. Protein and sugar in the urine were negative. Traces of bile were always present. The rectal temperature ranged from 101° to 101.8° F. which is within the normal range.

*From the Department of Medicine, The University of Chicago, Chicago, Illinois.

[1] Keeping Livestock Healthy, U.S.D.A. Year Book, 1942, p. 290.

[2] De Eds, F. and Thomas, J. O. Studies on Phenothiazine. *J. Parasit.*, 27, pp. 143-151. 1941.

On physical examination, the deep tendon reflexes in all extremities as well as the superficial abdominal reflexes were absent. Complete paralysis of all extremities was striking. The dog could not stand nor move his body in any manner. Signs of extreme pain were shown on light palpation of the musculature. In view of these findings a diagnosis of generalized polyneuritis was made.

The red cells numbered 7,230,000 per cubic millimeter and the white blood cells 2,250. Hematocrit reading was 45% by the Van Allen method.[3] On analysis of the serum, the total proteins were 6.16 grams per 100cc of serum, of which 3.26gm were albumin and 2.90gm were globulins; the non-protein nitrogen value was 35mg per 100cc; the water content was 91.65%; the chloride concentration was 114.2 mEq. per liter and potassium was 4.25 mEq. per liter of serum.

## Treatment

The treatment used in this dog was multiple and varied, and directed primarily to save his life. It is difficult therefore to assign proper credit or value to any one of the procedures.

The greatest attention was directed to giving enough intravenous fluids to maintain fluid balance in the animal and at the same time keep the urine volume high for the purpose of aiding in the excretion of the toxic substances. Each day for two weeks the animal received two intravenous injections of 500cc (morning and late afternoon) consisting of 0.9% sodium chloride in 10% dextrose solution. After this time the dog was drinking sufficiently and only one injection of the saline solution was given per day for another week.

Vitamins in large amounts were given daily to maintain and supplement the general nutrition. The Vitamin B complexes (Sol B) were given subcutaneously. Ascorbic acid, 100mg; nicotinamide, 100mg and thiamine chloride, 20mg were given orally. Food in a large part consisted of raw, chopped liver and kidneys.

To help in preventing infections in this paralyzed animal, 200,000 units of penicillin were given subcutaneously daily for two weeks.

## Discussion

The generalized polyneuritis in this dog following phenothiazine poisoning was very similar to the symptoms described in pigs following treatment with this drug as reported by Lapage,[4] Lekwa[5] and Thorning, Morrill and Boley.[6] The pigs, however, recovered in a shorter time than this dog. Of course the amount of drug consumed could have been very different.

The recovery of this dog occurred in stages. After three weeks, some of the body reflexes had returned, followed by the ability of the dog to raise his head. During the fifth and sixth week, the reflexes in the hind legs returned, followed by the return of use of the fore legs. The reflexes of the front paws were the last to return after which the dog was able to stand. Eight weeks elapsed before the dog was again mobile. Although weak, he did not hesitate to stand and walk a short distance when all his reflexes had slowly returned. After this the recovery was rapid and uneventful. The recovery was complete (Fig. 1).

The drug had no effect on the red blood cells in this dog, as shown by normal red counts and hematocrits. A leucopenia existed during the first week. After two blood transfusions of 500cc each, on a three-day interval, the white cell count rose to 6,500 and remained at this level. At no time was the blood non-protein nitrogen above 35mg per 100cc, indicating that the kidney function was not impaired. The total plasma protein content was normal, although the globulin fraction was higher than normal and the albumin fraction was lower. This might indicate a possible disturbance in the liver. The water content of the serum was normal, showing that the animal was not dehydrated; also the potassium content was normal indicating that the drug had no effect on the permeability of the tissue cells of the body. These normal chemical findings, therefore, demonstrate that the toxic reactions of this drug in this dog were, at the most, the result of a central nervous system impairment.

Since this drug is so toxic to dogs it should be used with caution in food mixtures for farm animals, and in such a way that dogs have no access to the mixtures. We have demonstrated that if a dog is poisoned by phenothiazine it can, under proper care and treatment, recover fully.

For that reason we feel that it is important that the experience of this dog be a part of the literature on phenothiazine. It may save many valuable animals from being needlessly destroyed.

## Summary

A case of phenothiazine poisoning in a farm dog is presented. Symptoms included the absence of the deep tendon reflexes in all extremities as well as the superficial abdominal reflexes. Complete paralysis of all extremities was striking. A diagnosis of generalized polyneuritis was made. It was demonstrated that if a dog be poisoned with phenothiazine, it can under proper care and treatment, recover fully.

[3] Van Allen, C. M. An hematocrit method. *J. Lab. and Clin. Med.*, 10, pp. 1027-1040. 1925.
[4] Lapage, G. Experiments on the anthelmintic action of phenothiazine. *Vet. Rec.*, 52, pp. 648-657. 1940.
[5] Lekwa, C. L. Phenothiazine poisoning in swine. *Vet. Med.*, 36, p. 448. 1941.
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# A Symptomatic Treatment for Canine Hysteria

By O. G. DAVIDSON and J. LA VERE DAVIDSON
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CANINE hysteria or fright disease, has always been somewhat of an enigma to small animal practitioners, both as to cause and treatment. While it is most commonly observed in young dogs, older animals are frequently presented to the veterinarian for treatment.

In the past many theories have been advanced as to the etiology of canine hysteria, such as toxic indigestion, parasitism, nutritional deficiencies, abscessed anal glands and others. We have nothing new to offer as to the cause of this condition. We do believe that the causes are varied and may be any one of a number of conditions, but feel that the syndrome observed is usually secondary to some primary etiologic factor or factors. From personal experience we believe that a large percentage of canine hysteria is due to a toxemia and tissue anoxia which are brought about by a catarrhal enteritis, either acute or chronic, and that this is especially true in puppies.

Many young dogs, even though they are on an adequate ration with a high intake of vitamins and minerals, will develop a depraved appetite for foreign matter. Perhaps the loss of the deciduous teeth and eruption of the second or permanent teeth may predispose them to this unnatural craving. We believe that after a long continued period of eating foreign matter (sticks, stones, straw, paper, etc.) a chronic catarrhal enteritis occurs accompanied by an extensive desquamation of the single layer of epithelial cells lining the villi of the small intestines. Under normal conditions these epithelial cells allow only food material, water, etc., to be absorbed, keeping back the toxic products of digestion. The denuded villi, however, allow not only food material, but also bacteria and toxins to be taken into the blood and tissues.

As the animals absorb more and more toxins, the tissues reach a state of partial anoxia; the brain, cord and their coverings become hyperemic and in this condition any undue noise or strain will provoke the animal to become hysterical. Fatalities are not frequent in canine hysteria, but those that succumb usually exhibit, upon necropsy, a catarrhal enteritis and hyperemia of the brain, cord and their coverings. Having held autopsies only on such animals as died *in extremis* we are not able to say at what stage in the disease these symptoms develop.

A review of the symptoms of canine hysteria is superfluous as all veterinarians are well acquainted with the characteristic manifestations.

### Treatment of Canine Hysteria

In the past various types of therapy have been advocated. Treatment, for the most part, has been symptomatic. Some cases have responded well. Others, in spite of treatment, gradually worsened and died. Sedatives, purges, special diets, vitamin and mineral supplements have been used mainly as supportive therapy.

### A Symptomatic Treatment

Recent studies in human beings have indicated that the oral or parenteral use of nicotinic acid in the treatment of certain special types of cephalalgia, such as migraine and malarial headache, has met with fair success. An article by Joseph W. Goldzieher, M.D., and George L. Pokin, M.D. (*J. Am. Med. Assn.*, 131:103, May 11, 1946) reports the successful use of intravenous sodium nicotinate in the treatment of several types of headaches in a series of 100 patients. Seventy-five received complete relief; 18 reported moderate to minimal relief, and seven were not benefited by treatment.

Sodium nicotinate ($C_5H_4NCOONa \cdot 1\frac{1}{2}\ H_2O$) is the sodium salt of nicotinic acid. In man, giving sodium nicotinate solution causes a marked "flushing" due to vasodilatation of the peripheral blood vessels. Some individuals receiving this treatment have referred to it as the "heat treatment." The relief of headache seems to be correlated with the degree of peripheral flush. This report concerning the successful use of sodium nicotinate solution in human beings led the authors to attempt to determine its usefulness in hysteria (running-barking fits) in dogs.

To date this drug has been used in 42 cases of hysteria in canine patients with very satisfactory results. All of these "fit cases" were diagnosed as hysteria caused apparently by an absorption of toxic material from the in-

testinal tract. The age of the dogs varied from three months to 12 years.

The symptoms exhibited were quite characteristic: restlessness, barking, running, hiding in dark places, champing of the jaws, involuntary voiding of urine and fecal matter, followed by exhaustion and muscular incoordination. All patients exhibited some elevation of temperature, averaging 102.8° F.

### Administration of Sodium Nicotinate

These canine patients received from 50 to 200mg of sodium nicotinate solution (Upjohn) intramuscularly or intravenously two to four times a day. Kaopectate was the only other treatment given and that only to individuals having a diarrhea. Sedative therapy was omitted in order more properly to evaluate the effectiveness of sodium nicotinate solution in the treatment of this condition. All cases were placed on a milk diet.

The hysterical syndrome was completely controlled in all cases but one, 31 of the 42 cases within 24 hours with no remissions, 10 of the animals required additional injections of sodium nicotinate for an additional 24 to 48 hours before the symptoms were controlled. In one case the injections were continued for four days but the dog became progressively worse and euthanasia was employed. We feel that this case may have been a manifestation of virus encephalitis. Incidentally, sodium nicotinate solution has not proved any more effective in nervous distemper than older lines of therapy.

### Summary and Conclusions

1. Forty-two dogs suffering from hysteria were treated with parenteral injections of sodium nicotinate solution (Upjohn). In 31 of the 42 complete abatement of the symptoms occurred within 24 hours. Treatment was continued on 10 dogs for an additional 24 to 48 hours resulting in complete recovery. In one dog the treatment was not effective.

2. We believe that in the treatment of canine hysteria, sodium nicotinate solution exerts its action by peripheral vasodilatation, and thus may draw the blood from the hyperemic areas of the brain, spinal cord and their covering. We are of the opinion that the prompt action is due to the vasodilatory action of sodium nicotinate and not to its nutritional properties.

4. Parenteral sodium nicotinate solution is suggested as symptomatic treatment of canine hysteria, caused, apparently, by absorption of toxins from the intestinal tract; its use in virus encephalitis has not proved effective.

5. The results obtained in the treatment of canine hysteria with sodium nicotinate solution would seem to justify further clinical investigation.

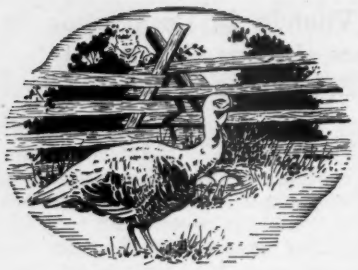
## Chronic Vitamin $B_1$ Deprivation in Litters of Dogs Can Affect Social Dominance

There have been a number of studies demonstrating the existence of social dominance among such vertebrates as hens, mice, canaries, cattle, and dogs; and changes in dominance have been studied in connection with hormone administration, as testosterone propionate, restriction of cage space, and with social variables, as introducing a new animal into an established social group (W. C. Allee. *Biol. Symp.*, 1942, 8, 139-162).

It was found in connection with another study in 1941 (I. A. Berg, *J. Exp. Psychol.*, 1944, 34, 343-368) that social hierarchies existed in each of five litters of puppies. In one litter of four males and one female, the least dominant animal, a male, was so severely bitten and so regularly driven from the feeding pan that he was isolated in a separate cage and given a special diet which included milk and raw beef. The other animals had earlier been placed on an exclusive diet of water, canned dog food, and a type of dry dog food. After three weeks the isolated animal was again placed in the cage with his littermates with the result that he reversed his previous social position and became the dominant animal of the litter after several fights with each of his littermates.

About a week after this an increasing loss of appetite, followed by symptoms of "Fright Disease," was noted in those animals which had been fed for several months on the commercial dog food ration. Following the suggestion made by J. W. Patton (*Vet. Med.*, 1939, 34, 372-381), 600 I.U. thiamine chloride were injected subcutaneously in all five animals daily for four days. Patton had noted that commercial dog foods are usually autoclaved and that $B_1$, being heat labile, is destroyed as a result of the autoclaving.

It is believed that the chronic $B_1$ deficiency resulting from the autoclaved dog food was directly related to observed changes in social dominance in this litter; for, after the series of $B_1$ injections, a number of fights ensued, and the previously dominant male resumed his ascendant position in the social hierarchy. The male which had originally been lowest and, after the special diet, highest in dominance ended as third highest in the social group of littermates. The female was lowest in the new hierarchy. This final order of dominance remained for almost two months, when no further observations were made. Similar dominance shifts associated with $B_1$ deprivation were noted in other litters.—*Science*, 105:2723, p. 272. 1947.



# Di-Isobutyl Phenoxy Ethoxy Ethyl Di-Methyl Benzyl Ammonium Chloride

## as an aid in the prevention of Protozoan Diseases of Poultry*

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DURING the last few years there has been a renewed interest on the part of research institutions, in investigating the values of chemicals in treating the protozoan diseases of poultry. Such studies have been under way in this laboratory for some time. This report summarizes the results of field trials in which di-isobutyl phenoxy ethoxy ethyl dimethyl benzyl ammonium chloride, hereafter referred to as Formula No. 144, was used as a protozoastatic agent against various types of pathogens found in the gastrointestinal tracts of birds.

Formula No. 144 was dispensed with or without added chemicals to be given in the drinking water. In a few instances the material was administered as the dry powder in capsules.

Preliminary experiments showed that Formula No. 144 was relatively non-toxic to birds, both when given in drinking water and when given in capsules.

The only available information on the protozoacidal action of this type of compound is in the report of Fair, Chang, Taylor and Wineman (1945) who found some detergents effective in killing the cysts of *Entamoeba histolytica*.

No direct toxicity studies were made with poults or chicks, but consuming Formula No. 144 over long periods, in the drinking water, in dilutions of 1:10,000 and 1:5,000 and stronger, produced no symptoms of toxicity. In nearly every case where Formula No. 144 was used, the attendants reported an increase in the amount of water consumed by the birds.

The results of the field trials are summarized in the following case reports. The data collected on the use of Formula No. 144 in naturally occurring cases of coccidiosis are summarized in Tables I and II.

Case 7. In this trial involving 500 poults Formula No. 144 with and without added chemicals was compared with sulfaguanidine against coccidiosis of poults.

The flock of 550 poults, of which 50 had died the week previous to treatment, was divided into groups and treated as shown in Table II.

Blackhead or enterohepatitis is used here to describe a disease syndrome in which the principal lesions are located in the liver and ceca but do not conform to the description of the gross pathology of histomoniasis and trichomoniasis as described by Allen (1945). In most of these cases called blackhead it is considered that both histomonads and trichomonads were present.

The data collected in the use of Formula No. 144 in naturally occurring cases of blackhead are summarized in Table III and case 20.

*Case 20.*—The history and treatment of this flock of poults is here outlined:

August 9. Diagnosis, histomoniasis. At this time four birds were sick and one had died in a flock of 90. The ration consisted of cracked wheat and lettuce and the birds were maintained in a small, backyard pen. Formula No. 144 was given in the drinking water at a dilution of 1:5,000.

August 16. One death occurred in the first seven days after the beginning of treatment.

September 11. Five poults died the previous week. Formula No. 144 was given in a 1:2,500 dilution. Four birds died during the following week.

October 31. Seven turkeys were lost the previous week. Formula No. 144 was given in a 1:1,666 dilution. The owner improved the ration and no further losses were reported. Approximately 50 turkeys were marketed.

In case 21 a mixed infection of histomoniasis and hexamitiasis was encountered in a flock of 2,350 poults divided into equal groups in four individual houses. The disease started in one house and three days later spread to all houses. The owner dosed the poults with a proprietary, coccidiosis medicine with no decrease in the number of sick poults. All houses were then cleaned and disinfected and the owner gave his birds worm medicine containing phenothiazine, copper sulfate and nicotine sulfate.

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The next day Formula No. 144 in a 1:10,000 aqueous dilution was given. The following day a noticeable decline in the number of new cases was observed. The death loss was approximately 600. This case is complicated by the use of so many drugs but, because it is the only one in which the Formula No. 144 was used where Hexamita were found, it is included in this series.

No cases of trichomoniasis of the crop of turkeys were found during the period of this investigation. The following case illustrates the protozoastatic value of Formula No. 144 in trichomoniasis in pigeons.

*Case 22.*—Formula No. 144 in a 1:10,000 aqueous dilution was given for seven days to a loft of 35 pigeons from which one bird submitted for diagnosis was found infected with trichomonads of the crop, liver, and intestines. Three pigeons had died in the three days preceding treatment and one was sick. Only one bird died after treatment and there has been no recurrence of the disease during observation over a six-month period.

Several flock owners used Formula No. 144 more or less continuously during the growing season as a prophylactic of blackhead. The usual procedure was to give the No. 144 for two or three days whenever birds showing symptoms of disease or "sulfur" colored droppings were found.

The control of the protozoan parasites of the gastrointestinal tracts of birds cannot be based on any single type of program. During the past 10 years investigations of trichomoniasis and histomoniasis of turkeys have been under way in this laboratory. Hawn (1937) described and established the etiology of trichomoniasis of the upper portion of the digestive tract of poults. In his work only 54% of poults inoculated contracted the disease. Each year we have exposed experimental poults and chicks by various means to the organisms of "blackhead." The transmission of the protozoan diseases has not been easy. Hadley (1916), and Gierke and Hinshaw (1936) had found a trichomonad associated with enteritis in poults. However, it was not until Allen (1945) described the lesions produced by both *Histomonas meleagridis* and *Trichomonas gallinarum* that it was possible, from the gross pathology, to differentiate between cases of enterohepatitis due to these organisms.

Bolin and Vardiman (1941) reported on the use of mapharsen in the treatment of "blackhead." They used naturally occurring cases and made no attempt to differentiate between histomoniasis and trichomoniasis. Later efforts at transmission of the two diseases were attempted. The results of these investigations can be summarized briefly as:

1. Turkeys fed rations high in carotene and animal protein are very resistant to infection by both histomonads and trichomonads.

2. The feces of wild rats fed organs of turkeys infected with histomonads and trichomonads and later fed to poults failed to transmit the disease.

3. Cecal insufflation of histomonad-containing material from the ceca of poults dying from

TABLE I.—FIELD TRIALS WITH FORMULA NO. 144 AGAINST INTESTINAL COCCIDIOSIS OF CHICKS AND POULTS

| Case No. | Species | No. in flock | No. sick | Deaths before treatment | Treatment | Days given | Deaths after treatment | Proprietary* medicine given |
|---|---|---|---|---|---|---|---|---|
| 1 | Chicks | 200 | 5 | 5 | No. 144—1:3,333 | 21 | 0 | 27 |
| 2 | Chicks | 200 | 75 | 7 | No. 144—1:10,000 | 2 | 3 | 3 |
| 3 | Chicks | 185 | 15 | 2 | No. 144—1:3,333** | 5 | 1 | 3 |
| 4 | Chicks | 600 | 300 | 73 | No. 144—1:10,000† | 4 | 56 | none |
| 5 | Poults | 130 | 10 | 0 | No. 144—1:3,333 | 5 | 0 | none |
| 6 | Chicks | 350 | 200 | 111 | No. 144‡ | 5 | 35 | none |

*Indicates the number of days the proprietary medicine was given. It was discontinued three weeks before giving Formula No. 144 in case 3. In the other cases the proprietary medicine was discontinued the day before Formula No. 144 was commenced.
**Copper ammonium chloride 1%. †Mercurochrome 1%. ‡Dilution not known.

TABLE II.—FIELD TRIAL USING FORMULA NO. 144 AND SULFAGUANIDINE

| Pen | No. birds | Medicine | Death Loss* | Days given |
|---|---|---|---|---|
| 1 | 100 | Formula No. 144 1:10,000 | 7 | 7 |
| 2 | 100 | No. 144 + copper ammonium chloride 1:10,000 | 7 | 7 |
| 3 | 100 | No. 144 1:10,000 + 1% sulfaguanidine in mash | 7 | 7 days Formula No. 144<br>2 days sulfaguanidine + No. 144 |
| 4 | 100 | 1% sulfaguanidine in mash | 10 | 2 |
| 5 | 100 | None | 15 | — |

*Up to seven days after treatment.

blackhead resulted in only 25% mortality in poults fed well-balanced rations.

4. On necropsy turkeys may show lesions of mild enterohepatitis without having shown visible symptoms of the disease.

5. Poults under constant exposure to histomonads and trichomonads appear to develop an immunity to these protozoa.

Our findings as to the protective action of carotene against infections with histomonads and trichomonads agree with those of Knight, McDougle and Durant (1942).

Ever since Graybill and Smith (1920) established the cecal worm, *Heterakis gallinae*, as a vector for transmitting *Histomonas meleagridis*, control of enterohepatitis has been directed against this worm. McCulloch and Nicholson (1940) found phenothiazine effective against the mature cecal worm, but Wehr and Olivier (1946) found this drug ineffective against immature cecal worms. Eveleth (1943) found phenothiazine without effect on histomonads in chickens.

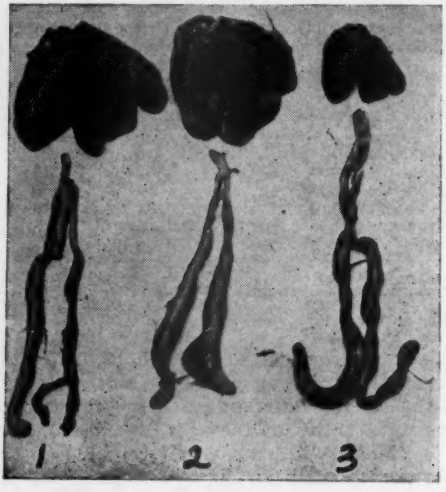


Fig. 1. Lesions typical of trichomoniasis of the liver and ceca (1 and 2). Normal liver (3)

The literature on drug treatment against intestinal protozoa of poultry is extremely voluminous. The protozoastatic value of sulfur against coccidia is to a large extent offset by its rachitogenic action. The sulfonamides have been shown to be very effective in controlling coccidiosis, but the expense, and in some cases the toxicity, have prevented more widespread use of them. For the gastrointestinal flagellates, relatively few drugs have been recommended as being either protozoastatic or protozoacidal. Tyzzer and Fabyan (1922) used ipecac and sulfur without success in treating blackhead.

Delaplane and Stuart (1935) in summarizing work done at the Rhode Island experiment station reported they had found no drugs effective in preventing or in curing blackhead.

Lee (1940) suggests the use of 4% tobacco dust in the mash to remove cecal worms. Craig and Doyle (1941) state that there is no medicine which has proved effective for blackhead.

Stafseth (1943) recommends colloidal iodine and extra protein while Johnson (1934) found iodine vermifuge ineffective in treating cases of blackhead.

Knight, McDougle and Durant (1942) recommend gentian violet and vitamin A in treating cases of trichomoniasis. Hinshaw (1943) recommends copper sulfate diluted 1:2,000 for treating trichomoniasis of the upper digestive tract and offers no medicinal treatment for coccidiosis, hexamitiasis, or blackhead of turkeys. In a later publication McNeil and Hinshaw (1945) found mercuric chloride very toxic for turkeys and of little value against Hexamita.

As mentioned above Hawn found only 54% of his poults susceptible to trichomonad infection. Our results in transmission of blackhead have been lower than 54%. During the years 1940-1946 a small lot was used for rearing turkeys for experimental use. This lot was repeatedly seeded with various types of protozoa particularly the histomonads and trichomonads of blackhead. Turkeys suffering from these diseases were often placed on the lot with the growing poults. Cecal worm ova were embryonated and put in the feed, however, the incidence of "blackhead" rarely exceeded 10% of the poults for a growing season.

During 1946 the following experiment was conducted. Seven turkeys kept from the previous year and considered as recovered cases of blackhead were placed in the lot with 109 poults. About a dozen old chickens known to have been exposed to both blackhead and cecal worms were kept with the turkeys and a "mudhole" was made for thirteen ducks, also kept in the lot. The mash fed after the poults were put on the contaminated lot is given below:

| | |
|---|---|
| Buttermilk (dried) | 8.8% |
| Meat and bone meal | 9.8% |
| Oats | 13.0% |
| Bran | 13.0% |
| Corn | 26.0% |
| Middlings | 13.0% |
| Alfalfa leaf meal | 4.2% |
| Bone meal | 3.9% |
| Salt | 0.9% |
| A and D supplement* | 1.7% |
| Oyster shell | 1.8% |
| Ground limestone | 1.3% |
| Grit | 2.6% |

*Cod liver oil mixed with grain base.

There were five deaths (4.6%) due to blackhead, and no cases of coccidiosis or hexa-

mitiasis diagnosed in the experimental lot of poults. As the young turkeys were dressed for market about 10% were observed to have mild, healed lesions suggesting a previous infection of the liver with either histomonads or trichomonads.

While this experiment had been designed to produce experimental birds for testing the value of various protozoastatic drugs, it clearly illustrated that the factor generally considered as of primary importance may be secondary to nutrition or some other factor.

While many points are still to be considered in the overall picture of control measures to be used against the gastrointestinal protozoa of birds it is well to reconsider some of the established methods which have been of value in handling these diseases in the past.

The following outline is suggested as a means of controlling these diseases.

### Control of Gastrointestinal Protozoa of Chickens, Turkeys, and Pigeons

1. *Sanitation program.*—Have the houses well ventilated, light, dry, and free from drafts. Have the feeders and waterers equipped so that

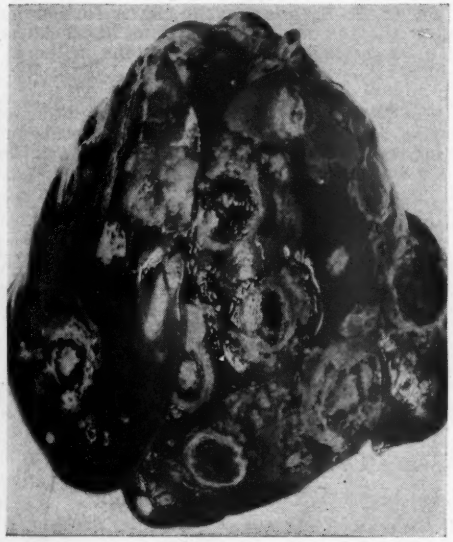

Fig. 2. Liver of turkey affected with trichomoniasis showing characteristic lesions. Note that there are only two small areas of normal tissue in each lobe of this liver. Light areas indicate dense collections of embryonic cells due to action of virus

droppings will not contaminate the feed and water.

Use sufficient litter to keep the floor always dry and permit no accumulations of droppings where birds can contact them.

Use a droppings pit arrangement if the birds are kept confined in houses.

If range shelters are used, move them at weekly intervals. Move feeders and waterers at frequent intervals.

Change range at weekly intervals or oftener if any disease is found in the flock.

Eliminate insect pests by spraying inside of all buildings or range shelters with DDT or other insecticide.

Remove from the flock any bird showing symptoms of disease.

Burn all dead birds.

Keep visitors out of the brooder houses and off the ranges.

2. *Nutrition program.*—Feed a complete ration including proteins from several sources, adequate amounts of vitamin A or carotene and extra vitamin D for poults kept indoors.

Furnish adequate amounts of *wholesome* drinking water. Water from many deep wells contains salts in sufficient quantities to produce mild enteritis and nephritis.

Furnish fresh green feed. Move to new pasture every week or confine the birds and cut fresh green feed for them daily. Leaf meal may be substituted for range in winter. Always have plenty of grit available. Feed a calcium supplement separate from the grit.

3. *Management program.*—Maintain proper brooder temperature. It is best to have the area next to the heat source higher than the required temperature and to have plenty of room for the young birds to move about and select the most comfortable temperature.

Feed and water each poult or chick as it is removed from the shipping carton.

The attendant should clean his shoes or put on overshoes as he enters the brooding house.

All brooder equipment should be cleaned and disinfected as each brood is removed and re-disinfected before being used again.

Do not introduce new birds into a brood that has been started for any length of time.

4. *Medication program.*—The quaternary ammonium compounds with or without the addition of other drugs are known to be bactericidal, protozoastatic and of relatively low toxicity to birds. If protozoan diseases of the digestive tract are encountered it is recommended that the Formula No. 144 be used as 1:5,000 dilution in the drinking water. The use of any chemical as a parasiticide or parasititatic agent is recommended only as an adjunct to the general sanitation, nutrition and management practices as outlined.

In those flocks where there is a history of losses from protozoan diseases it may be of value to use the Formula No. 144 (1:5,000) as a prophylactic before the disease manifests itself.

## Summary

1. A quaternary ammonium compound referred to here as Formula No. 144 has been found to possess protozoastatic properties against the protozoa commonly found as pathogens in the gastrointestinal tracts of birds.

2. Field trials indicate that Formula No. 144 is useful as a prophylactic in preventing recurrent blackhead in turkey flocks.

3. The importance of adequate nutrition as a means of preventing blackhead is discussed.

4. A program of disease control in poults is outlined.

## Acknowledgment

The authors wish to express their appreciation to the Fort Dodge Laboratories, Fort Dodge, Iowa, for the chemicals used and for financial assistance in conducting these investigations.

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TABLE III.—FIELD TRIALS WITH FORMULA NO. 144 AGAINST BLACKHEAD IN POULTS

| Case No. | Diagnosis | No. in flock | No. sick | Deaths before treatment | Treatment | Days given | Deaths after treatment |
|---|---|---|---|---|---|---|---|
| 8 | Histomoniasis | 545 | 0 | 80 | No. 144—1:10,000 | 5 and repeated when birds sickened | 0 |
| 9 | Histomoniasis | 5000 | 400 | 14 | No. 144—1:10,000 | 5 | 8 |
| 10 | Blackhead | 500 | 56 | 16 | No. 144—1:10,000* | 2 | 16 |
| 11 | Blackhead | 14 | 0 | 4 | No. 144—1:3,333 | 5 | 1 |
| 12 | Blackhead | 250 | — | — | No. 144—1:10,000 | No. 144 continuously | 0 |
| 13 | Blackhead | 400 | 10 | 0 | No. 144 None*** | 5 | 4 |
| 14 | Blackhead | 187 | 10 | 18 | No. 144—1:10,000 | 5—few still sick treatment resumed | 6† |
| 15 | Blackhead | 250 | — | 40 | No. 144—1:3,333** | 2—birds ill again in a week. Repeat treatment | 0 |
| 16 | Blackhead | 88 | 0 | 1 | No. 144—1:10,000 | 3—no new cases. Second treatment 14 days. 3 mo. later. No more losses | 0 |
| 17 | Blackhead | 132 | 12 | 50 | No. 144—1:5,000 | 5 | 5 |
| 18 | Blackhead | 1000 | 5 | 3 | No. 144—1:10,000 | 3—lapse of 12 days. Repeated 3 days | 10‡ |
| 19 | Blackhead | 489 | 0 | 3 | No. 144—1:3,333** | 5 | 3 |

*Formula No. 144 + 1% mercurochrome. **Formula No. 144 + 1% copper ammonium chloride.
†Proprietary medicine given for a period of 6 weeks previous to giving No. 144.
‡During lapse 19 birds became ill; 10 of these treated with mapharsen (.006gm in 1cc saline). Seven recovered Nine were given No. 144 in powdered form (1gm per bird); two recovered.
The authors express their thanks to Dr. D. D. Clark for making the intramuscular injections of mapharsen.
***Dilution not known.

# Clinical Reports

## Lymphatic Leucemia in a Dog

July 18, 1946, a four-year-old, brown and black coon hound weighing about 32 pounds was presented as a patient. Examination revealed a firm submaxillary swelling extending into the throat, angry tonsils and a temperature of 104°F. A tentative diagnosis of tonsilitis and probable septicemia was made.

The treatment consisted of swabbing the tonsils with 2% mercurochrome and applying alternating hot and cold packs to the region of the underjaw. In addition, 30,000 units of penicillin and 23 grains of sulfathiazole were given daily for four days. The dog improved and was released to the owner with directions to continue the sulfa drug for five days. Under this treatment, the temperature fell promptly, from 104° to 102° F.

August 10, the animal was returned for treatment. The swollen area in the submaxillary space had increased considerably in size and upon palpation one could tell that the swelling was firm throughout this area. No pain was evidenced upon pressure. The dog's respiration was labored indicating that the increased size of the tonsils were interfering with normal breathing. The popliteal lymph glands were sufficiently enlarged, to be seen easily. Temperature was 102° F.

Treatment consisted of painting the tonsils with 2% mercurochrome, alternating ice and hot packs locally, and sulfathiazole *per os*. This plan of treatment was continued until August 14 without avail as the swollen areas remained unchanged. However, respiration became quieter.

August 14th the intravenous treatment consisted of 15 grains of sodium sulfapyridine, 15,000 units of penicillin, lcc of liver extract and 5% dextrose in 100cc of sterile saline solution. In addition to this, two tablets each of ferro-sulfate and B & iron were gives *per os*. This plan of treatment was continued for 10 days. Intravenous injections of 250cc of whole blood being given August 19th and 20th.

The symptoms were: a bulging of the right side of the abdominal wall, just posterior to the ribs. A rounded firm object could be palpated in the swelling. This protruding organ was assumed to be the liver which had become enlarged. Also the dyspnea was more pronounced.

During the second stay of the animal in the hospital, blood cell counts had revealed the following blood picture:

**August 10th**
R. B. C. 3,150,000
W. B. C. 49,600
Differential count
60% normal neutrophils
24% normal lymphocytes
14% atypical lymphocytes
2 % monocytes

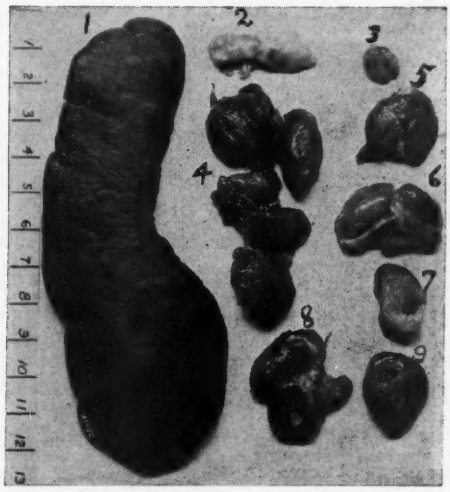
**August 15th**
R. B. C. 5,290,000
W. B. C. 50,550
Differential
48% normal neutrophils
22% normal lymphocytes
29% atypical lymphocytes
1% monocytes

**August 19th**
R. B. C. 2,750,000
W. B. C. 31,330
Differential count
1.4% juvenile
54.6% normal neutrophils
17.4% normal lymphocytes
23% atypical
5.3% monocytes

**August 21st**
R. B. C. 3,800,000
W. B. C. 44,400
Differential count
1% eosinophil
60% normal neutrophils
10% normal lymphocytes
23% atypical lymphocytes
6% monocytes

**August 24th**
R. B. C. 4,950,000
W. B. C. 47,600
39% normal neutrophils
16% normal lymphocytes
41% atypical lymphocytes
4% monocytes

On August 24 when it became apparent from the blood picture that this was definitely a case of lymphatic leucemia, as had been suspected for some time, euthanasia papers were signed by the owner and a necropsy was held.




1. Spleen. 13 inches by 4½ inches at its widest point; 2. Tonsil, approximately four times normal size; 3. Mediastinal lymph gland; 4. Lymphoid mass consisting of sub-maxillary, retropharyngeal and cervical lymph glands; 5. Popliteal lymph gland 2x1¼ inches; 6. Lymphoid mass in the abdominal cavity 2x3 inches; 7. Prescapular lymph gland 2¾x1¾ inches; 8. Lymphoid mass in the abdominal cavity; 9. Bronchial lymph gland.

Post-mortem examination revealed that the spleen had twisted so that its normal vertical

position was changed to horizontal (lateral side was ventral) and this organ and not the liver was responsible for the bulging of the abdominal wall. On appearance the color of the spleen was normal but its consistency was friable and moist. The lymph tissue throughout the body was somewhat reddened and had undergone hyperplasia. There were several lymphoid masses in the abdominal cavity.

The photograph depicts the abnormal organs clearly.

*Conclusion*—While the history of this case is limited, the condition of lymphatic leucemia in this dog occurred slowly for a few weeks and then gathered impetus in a few days so that the lymph tissue and white blood cells increased to a degree where there was no hope of saving the life of the dog. Medication and nursing failed to change the course of the disease. A great deal remains to be learned about this disease before a clear picture of the etiology is known.

Lymphatic leucemia is fairly common among cattle and dogs. Other domestic animals are seldom affected. It is usually a disease of old age although it is not entirely restricted to this group. Its peculiar characteristics consist of an increase of lymphoid cells in the blood stream as a result of hyperplasia of the lymphoid tissue. In the early stage the blood picture may be unchanged making it difficult to diagnose. The case cited is classified as a typical case of lymphatic leucemia.

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## Dyspnea of Unknown Origin in a Collie

A two-year-old, tan and white collie weighing about 30 pounds was brought to the veterinary hospital June 5, 1946, suffering from dyspnea. The altered breathing was first noticed six months previously. At that time, the dog was taken to a veterinarian, who pronounced the case pneumonia and treated the dog with one of the sulfonamides. The animal did not recover and was subsequently taken to another veterinarian who, according to the owner of the dog, diagnosed "gland trouble." The owner did not remember what treatment was employed.

As warm weather approached, the dyspnea grew steadily worse. About a week before the collie was brought to the clinic he had an attack of coughing and apparently was near asphyxiated when the attack subsided.

The dog had a temperature of 103.9° F. Respirations were estimated at 100 per minute and the pulse at 175. (Heart beats were so masked by respiratory movements that an accurate count was impossible. An attempt was made with a stethoscope to listen to the heart but respiratory noises were so loud that the heart sounds could not be distinguished.)

A fluoroscopic examination of the thoracic cavity showed a bulge in the diaphragm. This bulge was toward the heart and was especially noticeable on inspiration. Nothing else abnormal was seen and no X-ray pictures were taken.

A tentative diagnosis of diaphragmatic hernia was made; because of the nearly asphyxiated condition of the dog. Euthanasia was advised to end the suffering. Euthanasia papers were signed by the owner and the animal was given 15cc of nembutal intracardially.

The post-mortem examination showed that what was thought to be a diaphragmatic hernia was extensive adhesions between the pericardial sac and the left part of the aponeurosis of the diaphragm. These adhesions were on the left side only. The cause of the adhesions was not determined but, due to the absence of any infection and there being no history of any injury, they were suspected of being congenital.

There was a mild catarrhal enteritis in the small intestine. Six tapeworms *(Taenia pisiformis)* were found in the section of the intestine in which the enteritis was most severe.

The small intestine was laid open to the area where the bile duct opens. Pressure on the gall bladder caused a flow of bile into the intestine thus indicating that the bile duct was not occluded. The remainder of the small intestine and the rectum showed no significant abnormality. The stomach and esophagus also appeared normal.

The lungs were, for the most part, of normal consistency but there were some hard areas at the bifurcation of the primary bronchi. There were some white, apparently calcified areas in the hard spots and some small whitish yellow abscesses on the surface of the lung.

The heart, liver and spleen were normal in size, color and consistency and no valvular lesions were seen in the heart.

The kidneys were normal in size and the capsule over the kidney was easily peeled off. One kidney was cut open. There were white lines in the cortex. The condition was tentatively diagnosed as interstitial nephritis. Because this condition is found in most dogs over one year of age it was decided that the kidney condition was not related to the dyspnea.

Microscopic sections were taken from the lungs, liver, kidney and spleen. The condition in the kidney was positively diagnosed as interstitial nephritis. The sections from the lungs showed calcification and connective tissue for-

mation but there were no tissue formations definitely indicating any specific infection.

Acid-fast stains were made from material taken from parts of the lungs and from the small abscesses on the lungs, with negative results.

Two guinea pigs were inoculated, June 6th, with material from the small abscesses on the lungs. One of the guinea pigs died July 8th. This guinea pig had small yellowish white abscesses on its lungs. An acid-fast stain was made from material contained in the abscesses. No acid-fast organisms were found. The second guinea pig died August 2, 1946. There were small yellowish white abscesses on the lung of the second pig similar to those found in the first guinea pig. An unsuccessful attempt was made to find acid-fast organisms in the lung abscesses of the second guinea pig.

Insufficient lesions were found on autopsy to justify a diagnosis.

NORVAN MEYER

Deerfield, Kan.

## Pulpy Kidney Disease in Lambs

During Thanksviging vacation in my senior year in veterinary college I was asked to conduct a post-mortem examination on an eight-month-old lamb, one of three thousand being fed for the January lamb market. These lambs were kept on good rich wheat pasture. There was an abundance of salt and water before them at all times. The death loss in this band up to that time had been approximately 5%.

That morning this lamb was found dead in the corral. No symptoms had been noticed the previous evening when the herder drove the animals up for the night. The lamb probably died some time after midnight.

On post-mortem examination the following conditions were noted: absence of rigor mortis; the animal had been in exceptional condition; showing a great deal of fat present throughout the body and a heavy layer in the subcutaneous tissue; the wool was of good condition and apparently normal. On opening the abdominal cavity there was no offensive odor. The abomasum and small intestines were inflamed and hemorrhagic. There was a considerable amount of subserous hemorrhage on the intestines. The liver was friable, with several brownish areas. The kidneys were normal in size, of a pale yellowish color and the cortex was rather fluid. The whole kidney would flow with the consistency of thick jam beneath the capsule. Areas of hemorrhage, ranging from one inch to four inches in diameter were revealed in the subcutaneous tissue and fat, especially over the brisket. All other internal organs were normal.

My diagnosis was "pulpy kidney disease" which occurs in feeder lambs from overeating. This diagnosis was based on the large areas of hemorrhage and kidney and liver changes, and on the history that the herd had been continually on rich wheat pasture. According to Udall[1] and Boughton and Hardy[2] the findings of a soft kidney and a friable liver spotted with tawny colored areas are "almost pathognomonic" of this disease.

R. W. FOGLEMAN

Dallas, Tex.

**Bibliography**

1. Udall, D. H. *The Practice of Veterinary Medicine.* Published by the author, Ithaca, N. Y. 1943.

2. Boughton, I. B., and Hardy, W. T., Infectious Enterotoxemia (milk colic) of Lambs and Kids. Texas Agr. Exp. Sta. Bul. 598, 1941.

## Mandibular Paralysis in a Dog

A pointer 18 months of age with a history of having had difficulty in eating, and of acting somewhat abnormally for a day or two was presented for treatment.

Upon examination the animal showed typical symptoms of paralysis of the mandible and tongue and was isolated as a rabies suspect. However, it was noticed that the animal could eat with difficulty, was able to swallow food, but could not drink or close its mouth. A further examination revealed pharyngitis, inflammation of the retropharyngeal lymph glands, and paralysis of the anterior half of the tongue. Although the temperature was only 104.2° F., four tablets (7.7 grains each) of sulfathiazole were given *per os* in an attempt to overcome the pharyngitis, and the inflammatory condition of the retropharyngeal lymph nodes.

On the following day a new treatment was instituted consisting of: One ounce of pervinal,* one tablet (No. 1) of triple arsenates with sodium nucleint (Abbott), 50,000 units of vitamin A and eight ounces of water were given, *via* stomach tube, three times daily. The foregoing was continued for 10 days, discontinued for two days and repeated for one week.

*Summary.*—The paralysis of the mandible disappeared on the third day of treatment. On the 10th day the animal could move his tongue, but still the anterior one-half of his tongue appeared to be paralyzed, and he swallowed with difficulty. On the 16th day he started to drink on his own, and finally obtained full use of his tongue, but still was

*A liquid preparation consisting of the principal mineral supplements needed in animal nutrition, and containing vitamines A, $B_1$, $B_2$, $B_6$, and other factors of vitamin B complex, and vitamin D.

†Triple arsenates with sodium nuclein contain the arsenates of iron quinine and strychnine and sodium nucleate.

swallowing with difficulty. By the 19th day recovery was complete.

This seems to be the first case recorded of paralysis of the anterior one-half of the tongue.

Although there was no previous history of injury and the etiological factors could not be determined, it seems possible that there had been an injury of the mandibular branch of the trigeminal nerve.

F. M. SANTIAGO

Penuellas, Puerto Rico.

## Diaphragmatic Hernia in a Boston

September 9, 1945, a Boston terrier female, nine months of age, was presented for treatment immediately after having been struck by an automobile. The only noticeable symptom was marked dyspnea. A tentative diagnosis of diaphragmatic hernia was ventured. Barium sulfate was administered and a careful fluoroscopic examination made. No hernia was discovered at this time nor at a later examination. It was decided to hospitalize the animal and give a light diet.

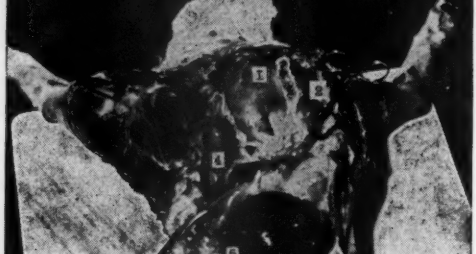


Illustration shows stomach (1) and spleen (2) both in the thoracic cavity. Cotton probe (3) passed through the esophagial hiatus, heart (4) liver (5)

At the end of eleven days the dyspnea had subsided considerably and the dog was allowed to return home. The owner was cautioned against permitting any violent exercise. It was further suggested that in the event the breathing did not return to normal within two more weeks, a radiograph be taken.

October 15, the dog was brought in for worming and a check-up. Fecal examination was negative and the animal appeared normal in every respect.

More than 18 months later (May 6, 1947) a call was received at 2:20 a.m. to attend this bitch. The complaint was that she could hardly get her breath and that something must be caught in her throat. The examination revealed a severe dyspnea, pneumonia in both lungs, subnormal temperature, pulse of 148.

An unfavorable prognosis was made after considering the history of the case. She was taken to the hospital for the purpose of taking a radiograph later in the morning. She died about 6:00 a.m.

A necropsy revealed complete hernia of the stomach and spleen through the much stretched tendinous ring of the hiatus esophagus. (See illustration.)

R. F. VIGUE

Sanford, Me.

## Radiotherapy in Adenocarcinoma of the Anus

An eleven-year-old, English bulldog was brought to me for examination. It had three tumor-like masses around the anus. Surgery was decided upon and the operation was performed; removing the three tumors. Microscopic examination of the tumors revealed them to be adenocarcinomas. True to type, the masses grew back to original form and even slightly larger within a matter of a few months.. It was then decided to use radiotherapy. Table I gives the procedure followed.

TABLE I.—400 RADIATION UNITS WERE EMPLOYED AT EACH TREATMENT.

| Kilovolts | Anode skin distance | milliamps |
|---|---|---|
| 200 | 30cm. | 25 |

| Date | Minutes | Total R. per port |
|---|---|---|
| Nov. 13, 1946 | 4 | 400 |
| Nov. 14, 1946 | 4 | 800 |
| Nov. 15, 1946 | 3 | 1200 |
| Nov. 19, 1946 | 4 | 1600 |
| Nov. 26, 1946 | 4 | 2000 |
| Nov. 27, 1946 | 4 | 2400 |
| Dec. 18, 1946 | 4 | 2800 |
| Dec. 19, 1946 | 4 | 3200 |
| Dec. 20, 1946 | 4 | 3600 |
| Dec. 23, 1946 | 4 | 4000 |
| Dec. 26, 1946 | 4 | 4400 |

After the first two treatments the skin around the anus, scrotum, and sides of the legs, reddened and the hair began falling out. However, the treatment was reduced by one minute and then continued in the usual procedure. After six treatments the animal was given a rest for three weeks and then five additional treatments were given.

About one month after the final treatment the burnt skin was approaching normal and

the hair was growing back. The masses around the anus appeared very dark red and gelatinous. They were then squeezed out leaving large cavities in the skin. Evidently these gelatinous masses were groups of dead cells from the effect of the x-rays. Sulfathiazole and urea creme was applied to these excavations in the skin and within two weeks they had healed up completely, much to the satisfaction of the owner, to myself, and of course, to the dog.

Chapel Hill, N. C. LOUIS L. VINE

## The Intravenous Use of Formalin as a Hemostatic

In veterinary practice, there is often a need for a simple and sure method of controlling internal hemorrhage whether it be caused by mechanical injury or be post operative, due to a severed blood vessel improperly ligated, or to hemorrhage from no apparent cause such as is often encountered in cows giving bloody milk. Knowing of no simple and sure product on the market, which gives complete satisfaction for this purpose, I resorted to a certain degree of experimentation and found a preparation which is simple to prepare and administer; sure in its hemostatic action, in every case where I have used it to date, and also safe. The drug I refer to is formalin (or a solution of formaldehyde) in water, injected intravenously.

Milks* states that the intravenous injection of formalin has been used in septicemia and purpura hemorrhagica. Also that intravenous injection of a strength up to 1:5000, in physiological saline solution produces no physiological reaction. It was thus deemed that at least there should be no great danger to the life of the animal in using this drug intravenously. Of course, I had often observed a rapid hemostatic action on bleeding vessels from the local application of formalin solutions.

My greatest use of this method of hemostasis has been in cows giving bloody milk. In about 20 cases, which I have treated, in every instance the use of formalin intravenously has stopped hemorrhage into the udder almost immediately. At the first milking after a single treatment, there was still some trace of blood in the milk, probably from the residual blood in the milk cistern but, by the second milking, there was no bloody milk and I have not as yet been called back to a case which resumed bleeding at a later date. The strength of formalin solution used for an adult cow was 2%, 10cc in 500cc of water. The only reaction noted on injection were an increased respiratory rate and epiphora. In the case of two small cows weighing 600 to 700 pounds each, this dyspnea became very marked and the injection was stopped at 350cc of the solution. The accelerated respiration has not lasted longer than 30 minutes and there have been no permanent ill effects noted in any case. This treatment has always resulted in a well pleased client, since usually without treatment the cow will continue to give bloody milk indefinitely and is eventually given up as hopeless and either sold for slaughter or removed from the milking line and used as a nurse cow for calves.

The same treatment was employed on one occasion when a colt, which had been castrated early in the morning, was still bleeding that night. The hemorrhage stopped almost immediately after the formalin treatment. At another time, a bitch which I had spayed was found an hour later to be bleeding profusely from the abdominal incision. The loss of blood was so great the mucous membranes were white and she was going into shock. To reopen the incision, enlarge it and hunt for the bleeding artery would probably have meant prompt death. Therefore, I injected 0.5cc of formalin in 10cc of water into the radial vein. The animal was returned to the cage with the hemorrhage arrested and made a complete recovery. A word of warning at this point, however, do not allow any of the solution to escape into the tissues. A small amount was deposited outside the vein in this instance and, seven days later, an area of the size of a quarter dollar sloughed at the site of injection.

As formalin *per os* has long been recommended as a treatment for mastitis, its use intravenously would logically be expected to give even more beneficial results as a bacteriostatic in the blood stream, and in elimination as formaldehyde *via* the udder. I have tried this treatment in a number of cases of acute mastitis and am certain that I obtained beneficial results in some instances. I have not used it in a sufficient number of cases to be entirely sure of the results, but certainly it has proved more useful to me than any of the large number of "mastitis cures" now on the market. This is especially true in cases which have just started to show inflammation, and the swelling of the udder is of only a few hours duration. I have seen such inflammation subside over night and the physical appearance of the udder and the milk remain normal without further treatment. I believe that further study of this method of treatment in mastitis may be very profitable. As for the hemostatic action of formalin intravenously, there can be no question, in my mind, of its usefulness.

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Clearwater, Kans.

*Practical Veterinary Pharmacology Materia Medica and Therapeutics, 5th Edition. Alex. Eger, Chicago.

# Abstracts

## Unsuspected Prevalence of Rabies

Surveys[36] of rat and dog population of Birmingham, Alabama were made to determine the incidence of rabies. Five hundred rats were examined and no evidence of rabies found. The dog survey, including examination of 533 apparently normal animals from the city pound, revealed that undiscovered or unsuspected rabies in dogs greatly exceeds the recorded incidence.

* * * *

## Hereditary Lameness in Red Danish Cattle

This inherited[8] lethal factor in the Red Danish dairy breed of cattle consists of complete inability to stand. Calves are born with the disability and lie on their sides with limbs stretched out and often with flexed fetlock joints. Otherwise they are normal, but after two to three weeks the effect of decubitus runs its lethal course. No affected calf survives.

The defect is known in a number of places in Denmark and has been verified in 249 calves, the progeny of 39 bulls and 213 cows. The first cases appeared in 1924 and their number increased progressively up to 56 in 1941.

The genetical nature of the defect was worked out and is described.

* * * *

## Chlorophyll in Wound Healing

In reporting his own observations and that of 30 officers of the staff of the Winter General Hospital, the author[29] cites 400 cases of a variety of surgical conditions in which water soluble chlorophyll was used in the treatment of clean and infected wounds. Within two or three days the objectionable odors had disappeared, there was cessation of pus formation and granulation tissue formed more rapidly and seemed to be of firmer, finer texture. There were no adverse systemic reactions nor skin irritations and chlorophyll wet dressing proved more soothing than those of saline or boric solution or penicillin. Chlorophyll is not a bactericide and only mildly bacteriostatic. The beneficial effect results through stimulation of the cells of the host, and there is a tendency to overproduction of granular tissue if the wet dressing is used longer than one week. Conditions in which chlorophyll was used successfully included osteomyelitis, thoracic empyrema, sinus infection, intra-abdominal and pleural abscess cavities.

* * * *

## Rayon as a Surgical Dressing for Surface Wounds

The conception of fundamental principles of wound healing, in the light of modern physiologic research, has undergone marked change during the past few years.[37] As a result, many worthwhile revisions in routine treatment have been suggested. One of these has been the pressure dressing, today commonly accepted in the treatment of burns and large surface wounds. This therapy has been described by numerous authors, but one important component part of the pressure dressing which deserves more study is the material placed in immediate contact with the wound.

Discussion on this subject has been controversial and there exists a variety of opinions regarding the proper material for this purpose. Many are still of the opinion that the ideal dressing for placement in immediate contact with a wound is fine mesh gauze (44 by 40) impregnated with some nonirritating type of grease, such as petrolatum or hydrous wool fat or merthiolate ointment.

A number of constant factors have been found which reflect unsatisfactory healing when ordinary dressings have been used: pain, excessive bleeding, delayed healing, and interference with drainage where grease dressings have been applied. It is felt that these factors are reflections of the types of materials which have been used for immediate contact with surface wounds. Pain and bleeding seem to be related to the open mesh of the ordinary dressing, since the mesh is sufficiently wide to permit the penetration of capillary buds. As a result of this capillary penetration, the newly formed blood vessels have been torn when dressings were changed. Friction frequently develops between dressings and wounds when a coarse material is used in immediate contact with a wound. Because of this, grease dressings have been used in an effort to diminish irritation and delayed healing.

The ideal dressing for immediate contact with the wound should conform to certain physiologic principles: it should be easily sterilized; it should be of a weave sufficiently close to block the entrance of capillaries into the substance of the fabric; it should permit adequate drainage, and it should have a low coefficient of friction, thus reflecting a minimal irritation to the underlying wound. Experi-

[36] Denison, G. A., and Leach, C. N. Incidence of rabies in dogs and rats as determined by survey. *Am. J. Pub. Hlth.*, 30:267. 1940.

[8] Investigations on hereditary lameness in Red Danish cattle. (Trans Title), Nielsen, J. (1942). Undersogelser over Forekomsten av arvelig Lamhed inden for R.D.M. *Nord. FoedbrForskn*, 24, pp. 97-100. Abst. *Vet. Bul.*, 16:10. p. 358. 1946.

[29] Bowers, W. F., Chlorophyll in wound healing and suppurative disease. *Am. J. Surg.*, 73, p. 37. 1947.

[37] These experiments here related were conducted at Tulane University, Ochsner Clinic, Touro Infirmary, Eye, Ear, Nose and Throat Hospital and Charity Hospital of New Orleans, under supervision of Neal Owens, M. D.

ments were designed and numerous fabrics were used in an effort to obtain a material which would fulfill these requirements. Nylon was tested in October, 1943. After observing many applications of this material, results seemed to be satisfactory in some respects, but nylon failed to fulfill all of the physiologic requirements enumerated.

Shortly thereafter experimentation with rayon was conducted. An attempt was made to determine the fineness of weave which would be required to block the entrance of capillaries, presuming the diameter of the smaller type of capillary to be around eight to nine microns. A very fine weave of approximately 114 by 114 was used for the initial experiment with rayon. This material proved satisfactory for, upon removal of the dressing, it was found that there was little disturbance to the underlying granulation. In attempting to evaluate more accurately the diminution of capillary permeability into the rayon, paraffin blocks of portions of rayon and fine mesh gauze were made. From these blocks, sections were cut and mounted for microscopic examination. Studies of these sections revealed that capillaries penetrated the open mesh gauze, while the weave of the rayon was sufficiently fine to prohibit entrance of the capillary buds into the substance of this material.

Bleeding is a constant factor following the removal of a surgical dressing when open mesh type of material is used. Pain and bleeding were markedly reduced when the rayon was used. Rayon showed permeability which permitted adequate drainage; in no instance was it felt that the drainage was blocked. When used under a pressure dressing, a granulating tissue was produced which appeared smooth, red and velvety. Reduction of infection was apparently facilitated by the use of this material.

The rayon and nylon used in these experiments were moistened with normal saline solution or 2% acetic acid, buffered to a hydrogen-ion concentration of 4.0% with sodium acetate, before being applied to the wound. On no occasion was grease used nor were sulfonamide drugs added.

When applying rayon in contact with an infected wound, the entire dressing is rendered slightly moist, otherwise the secretions from the wound have a tendency to become dry. If this is permitted to develop and a moist, capillary-drainage type of dressing is not constantly maintained, the wound is sealed effectively and drainage is blocked. When rendering the dressing moist, capillary drainage is established between the wound and the substance of the dressing, thus preventing unnecessary absorption from a puddling of secretions.

When removing the dressing from a noninfected wound, it is advisable to moisten the rayon with a bit of ether. Thus the sebaceous material, which frequently dries between the dressing and the noninfected wound, is dissolved and the dressing literally falls away with no adherence whatsoever. When removing a moist capillary-drainage type of dressing from an infected wound, this difficulty is not encountered because the moisture in the dressing prevents adherence.—H. J. MOSTYN.

## Treatment of Mange in Horses

Benzyl benzoate was applied[38] pure or dissolved 1:5 in olive oil, or in an emulsion containing equal parts of the drug, soft soap and 90% alcohol, to the moist skin in the region of the lesions after clipping and washing. Application was by vigorous use of a brush, softening and raising the crusts. This procedure was repeated after one hour and the next day the horse was washed and groomed.

Three cases of sarcoptic, five of psoroptic, and two of chorioptic mange were completely cured, as confirmed by microscopic examination of scrapings.

## Technic of Sero-Anatoxitherapy of Tetanus

In the horse the technic of the treatment[35] is as follows: subcutaneous injection of 20cc of tetanic anatoxin (toxoid) with tapioca followed a quarter of an hour later and at another part of the body with a single massive dose, intravenously or intramuscularly, of 150,000 to 200,000 units of antitetanic serum, that is, 15 to 20 ampoules of 10,000 units each, or better still 10 ampoules of 10,000 units each of the highest antitoxic value now currently produced by the methods of Ramon and his collaborators.

The anatoxin injection is repeated three times at intervals of four to five days in doses of 20cc. It is indicated, to reinforce the active immunity, to give another 20cc dose in six months or in case another traumatism opens a new portal for the admission of tetanus toxin.

For small animals, dogs for example, the dose of antitoxin injected is from 20,000 to 100,000 units according to the size of animal and of anatoxin three injections of 3cc to 5cc at three- to four-day intervals. In the use of sero-anatoxitherapy, other therapeutic methods are not omitted. The results obtained up to the present time are superior to those on record for other methods of treating tetanus.

[34] Brizard, A. Le benzote de benzyl dans le traitement des gales du cher al. *Rev. Méd. Vét.*, 94, pp. 267-274. 1943. Abst. from *Vet. Bul.*, 17:1, p. 45. 1947.

[35] Richou, R. La sero-anatoxitherapy en medecine veterinaire. *Rec. de Med. Vet.*, 123:3, pp. 112-118. 1947.

# Book Reviews

**Bloodhounds and How to Train Them.** By *Leon F. Whitney,* D. V. M., 142 pages; 43 illustrations. Published by Orange Judd Publishing Company, New York, 1947. Price $2.00.

So many books have been written, and more are being written every year and every month, about dogs that it is difficult to believe anything new can be told of this favorite animal of fact and fiction. However, Doctor Whitney has shown quite the contrary is the case. This work exploits an almost untouched field.

The text is considerably broader than the title indicates, since the history of bloodhounds is given and bloodhound types are described, as is also the usefulness of the breed, the achievements of bloodhounds and the presentation of bloodhound evidence in court.

In the main body of the work, the training of bloodhounds the author is on ground as familiar as his desk, for he has bred them, hundreds of them, showed them, raised them, sold them (was the first to ship breeding stock to England the home of the bloodhound) and given them away. He has entered them in field trials and not only trained them in large numbers, but he has employed them in a dozen states in trailing lost children, insane persons and criminals. He has succeeded in all these activities and now in another, writing about bloodhounds, he succeeds in being both entertaining and instructive.

* * * *

**Diseases of the Pig and Its Husbandry.** By *David J. Anthony,* M.R.C.V.S., D.V.S.M., F.R.S.I. Second edition; 297 pages; 53 illustrations. Williams and Wilkins, Baltimore. 1947. Price $4.00

It seems strange for American veterinarians to go to England, or to any other land for a work on swine disease, since the swine industry in this country is far greater than in any other. However, this work is quite cosmopolitan and the review of American veterinary literature on swine disease fairly extensive.

The treatise begins with 72 pages on swine husbandry which is without interest to American veterinarians. In the following 200 pages, 180 ailments, 49 parasites and parasitism and 52 poisons and poisonings are discussed.

It will thus be seen that the discussions are very brief. The treatise on hog cholera occupies 11 pages; on tuberculosis 8½ pages; on swine erysipelas and pox each four pages. The chapter on parasitology occupies 34 pages and that on poisons and poisoning 26 pages.

The work will be found useful in this country particularly for the uncommon ailments of swine. The discussion of the more common and economically more important diseases in this country, hog cholera, swine erysipelas, salmonellosis and disease of young pigs are scarcely on a plane that will prove useful to American veterinarians. The chapters on parasites and parasitisms and on poisons and poisonings will prove very useful for reference and as a means of identification.

* * * *

**Laws About Dogs.** By Capt. Will Judy, Member of the Illinois bar, Editor of *Dog World Magazine,* author of various works on the dog. 5th edition; 16 pages; paper. Publishd by Judy Publishing Co., Chicago, 1947. Price 30 cents.

This pamphlet is one of a series of 12, known as Handy Dog Booklets, all by the same author. This booklet serves a useful purpose in presenting concise information for dog owners as to their privileges, rights and responsibilities in dog ownership. Subjects treated include: history and sources of canine law; title of ownership in a dog; licenses and taxes; justifiable killing of dogs; restraint, quarantine, examination, inoculation; protection of the rights of dog owners; liability of dog owner for acts of his dog; laws against cruelty; laws particularly affecting breeders, kennelmen, exhibitors, dealers and veterinarians.

An appendix contains a model dog law.

As much of this treatise affects veterinarians directly in their professional work and other parts deal with matters upon which they are consulted frequently by clients, the pamphlet is one every veterinarian will want to obtain.

* * * *

**The Practice of Veterinary Medicine.** By *D. H. Udall,* B.S., D.V.M., D.Sc. Professor of Veterinary Medicine and Superintendent of the Ambulatory Clinic emeritus in the New York State Veterinary College at Cornell University. Fifth revised edition; 751 pages; 108 illustrations. Published by the author, Ithaca, New York. 1947. Price $7.50.

The fifth edition, following by just over three years the fourth edition of this well known work will be welcomed by the veterinary profession to whose information on the diseases of the herbivora and their treatment it has contributed largely during the past 15 years.

In this edition, which contains 30 pages and six illustrations more than its immediate predecessor, the author takes cognizance of the importance that penicillin has assumed in the treatment of mastitis and injuries of the teat duct, in calf pneumonia and other respiratory affections, and also of the newer and improved sulfonamide compounds.

Numerous other changes have been made including especially sections on diseases of calves, acetonemia and mastitis. The high standards set by previous editions are maintained.